JUNOSe™ Software
for E-series™ Routing Platforms

Broadband Access Configuration Guide

Release 9.1.x

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Table of Contents

About This Guide

This preface provides the following guidelines for using the *JUNOSe™ Software for E-series™ Routing Platforms Broadband Access Configuration Guide*:

Objectives

This guide provides the information you will need to configure routing and remote access on your E-series router.

An E-series router is shipped with the latest system software installed. If you need to install a future release or reinstall the system software, refer to the procedures in *JUNOSe System Basics Configuration Guide, Chapter 3, Installing JUNOSe Software*.

NOTE: If the information in the latest *JUNOSe Release Notes* differs from the information in this guide, follow the *JUNOSe Release Notes*.

Audience

This guide is intended for experienced system and network specialists working with E-series routers in an Internet access environment.

E-series Routers

Seven models of E-series routers are available:

- E120 router
- E320 router
- ERX-1440 router
- ERX-1410 router
- ERX-710 router
- ERX-705 router
- ERX-310 router

All models use the same software. For information about all models except the E120 router and the E320 router, see *ERX Hardware Guide, Chapter 1, ERX Overview*. For information about the E120 router and the E320 router, see *E120 and E320 Hardware Guide*, *Chapter 1*, *E120 and E320 Overview*.

In the E-series documentation, the term ERX-14xx models refers to both the ERX-1440 router and the ERX-1410 router. Similarly, the term ERX-7xx models refers to both the ERX-710 router and the ERX-705 router. The terms ERX-1440 router, ERX-1410 router, ERX-710 router, ERX-705 router, ERX-310 router, E120 router, and E320 router refer to the specific models.

Documentation Conventions

Table 1 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.

Table 2 defines text conventions used in this guide and the syntax conventions used primarily in the *JUNOSe Command Reference Guide*. For more information about command syntax, see *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Text Conventions		
Bold text like this	Represents commands and keywords in text.	■ Issue the **clock source** command. ■ Specify the keyword **exp-msg**.
Bold text like this	Represents text that the user must type.	host1(config)**#traffic class low-loss1**

`Fixed-width text like this`	Represents information as displayed on your terminal's screen.	`host1#show ip ospf 2`
		`Routing Process OSPF 2 with Router ID 5.5.0.250`
		`Router is an Area Border Router (ABR)`

Italic text like this	■ Emphasizes words. ■ Identifies variables. ■ Identifies chapter, appendix, and book names.	■ There are two levels of access, *user* and *privileged*. ■ *clusterId*, *ipAddress*. ■ *Appendix A*, *System Specifications*.
Plus sign (+) linking key names	Indicates that you must press two or more keys simultaneously.	Press Ctrl + b.
Syntax Conventions in the *Command Reference Guide*		
Plain text like this	Represents keywords.	terminal length
Italic text like this	Represents variables.	*mask*, *accessListName*
| (pipe symbol)	Represents a choice to select one keyword or variable to the left or right of this symbol. (The keyword or variable can be either optional or required.)	diagnostic | line
[ ] (brackets)	Represent optional keywords or variables.	[internal | external]
[ ]* (brackets and asterisk)	Represent optional keywords or variables that can be entered more than once.	[level1 | level2 | l1]*
{ } (braces)	Represent required keywords or variables.	{ permit | deny } { in | out } { *clusterId* | *ipAddress* }

Related E-series and JUNOSe Documentation

The E-series and JUNOSe documentation set consists of several hardware and software guides, which are available in electronic and printed formats.

E-series and JUNOSe Documents

Table 3 lists and describes the E-series and JUNOSe document set. For a complete list of abbreviations used in this document set, along with their spelled-out terms, see *JUNOSe System Basics Configuration Guide, Appendix A, Abbreviations and Acronyms*.

Table 3: Juniper Networks E-series and JUNOSe Technical Publications

Document	Description
E-series Hardware Documentation	
E120 and E320 Quick Start Guide	Shipped in the box with all new E120 and E320 routers. Provides the basic procedures to help you get the routers up and running quickly.
E120 and E320 Hardware Guide	Provides the necessary procedures for getting E120 routers and E320 routers operational, including information about: ■ Installing the chassis and modules ■ Connecting cables ■ Powering up the routers ■ Configuring the routers for management access ■ Troubleshooting common issues Describes switch route processor (SRP) modules, line modules, and I/O adapters (IOAs) available for E120 and E320 routers.
E120 and E320 Module Guide	Provides detailed specifications for line modules and IOAs in E120 and E320 routers, and information about the compatibility of these modules with JUNOSe software releases. Lists the layer 2 protocols, layer 3 protocols, and applications that line modules and their corresponding IOAs support. Provides module LED information.
E-series Installation Quick Start poster or *ERX Quick Start Guide*	Shipped in the box with all new ERX routers. Provides the basic procedures to help you get an ERX router up and running quickly.
ERX Hardware Guide	Provides the necessary procedures for getting ERX-14xx models, ERX-7xx models, and ERX-310 routers operational, including information about: ■ Installing the chassis and modules ■ Connecting cables ■ Powering up the routers ■ Configuring the routers for management access ■ Troubleshooting common issues Describes switch route processor (SRP) modules, line modules, and I/O modules available for the ERX routers.
ERX Module Guide	Provides detailed specifications for line modules and I/O modules in ERX-14xx models, ERX-7xx models, and ERX-310 routers, and information about the compatibility of these modules with JUNOSe software releases. Lists the layer 2 protocols, layer 3 protocols, and applications that line modules and their corresponding I/O modules support. Provides module LED information.

Table 3: Juniper Networks E-series and JUNOSe Technical Publications (continued)

Document	Description
ERX End-of-Life Module Guide	Provides an overview and description of ERX modules that are end-of-life (EOL) and can no longer be ordered for the following routers: ■ ERX-7xx models ■ ERX-14xx models ■ ERX-310 router
JUNOSe Software Guides	
JUNOSe System Basics Configuration Guide	Provides information about: ■ Planning and configuring your network ■ Using the command-line interface (CLI) ■ Installing JUNOSe software ■ Configuring the Simple Network Management Protocol (SNMP) ■ Managing the router and its modules, including the use of high availability (HA) for SRP redundancy ■ Configuring and running a unified in-service software upgrade (ISSU) ■ Configuring passwords and security ■ Configuring the router clock ■ Configuring virtual routers
JUNOSe Physical Layer Configuration Guide	Explains how to configure, test, and monitor physical layer interfaces.
JUNOSe Link Layer Configuration Guide	Explains how to configure and monitor static and dynamic link layer interfaces.
JUNOSe IP, IPv6, and IGP Configuration Guide	Explains how to configure and monitor IP, IPv6 and Neighbor Discovery, and interior gateway protocols (RIP, OSPF, and IS-IS).
JUNOSe IP Services Configuration Guide	Explains how to configure and monitor IP routing services. Topics include: ■ Routing policies ■ Firewalls ■ Network Address Translation (NAT) ■ J-Flow statistics ■ Bidirectional forwarding detection (BFD) ■ Internet Protocol Security (IPSec) ■ Access Node Control Protocol (ANCP), also known as Layer 2 Control (L2C) ■ Digital certificates ■ IP tunnels ■ Virtual Router Redundancy Protocol (VRRP) ■ Mobile IP home agent
JUNOSe Multicast Routing Configuration Guide	Explains how to configure and monitor IP multicast routing and IPv6 multicast routing. Topics include: ■ Internet Group Management Protocol (IGMP) ■ Protocol Independent Multicast (PIM) ■ Distance Vector Multicast Routing Protocol (DVMRP) ■ Multicast Listener Discovery (MLD)

Table 3: Juniper Networks E-series and JUNOSe Technical Publications (continued)

Document	Description
JUNOSe BGP and MPLS Configuration Guide	Explains how to configure and monitor: ■ Border Gateway Protocol (BGP) routing ■ Multiprotocol Label Switching (MPLS) and related applications ■ Layer 2 services over MPLS ■ Virtual private LAN service (VPLS) ■ Layer 2 virtual private networks (L2VPNs)
JUNOSe Policy Management Configuration Guide	Explains how to configure, manage, and monitor customized policy rules for packet classification, forwarding, filtering, and flow rates. Also describes the packet mirroring feature, which uses secure policies.
JUNOSe Quality of Service Configuration Guide	Explains how to configure quality of service (QoS) features to queue, schedule, and monitor traffic flow. These features include: ■ Traffic classes and traffic-class groups ■ Drop, queue, QoS, and scheduler profiles ■ QoS parameters ■ Statistics
JUNOSe Broadband Access Configuration Guide	Explains how to configure and monitor a remote access environment, which can include the following features: ■ Authentication, authorization, and accounting (AAA) ■ Dynamic Host Configuration Protocol (DHCP) ■ Remote Authentication Dial-In User Service (RADIUS) ■ Terminal Access Controller Access Control System (TACACS+) ■ Layer 2 Tunneling Protocol (L2TP) ■ Subscriber management
JUNOSe System Event Logging Reference Guide	Describes the JUNOSe system logging feature and describes how to use the CLI to monitor your system's log configuration and system events.
JUNOSe Command Reference Guide A to M; JUNOSe Command Reference Guide N to Z	Together constitute the *JUNOSe Command Reference Guide*. Contain important information about commands implemented in the system software. Use to look up: ■ Descriptions of commands and command parameters ■ Command syntax ■ A command's related mode ■ Starting with JUNOSe Release 7.1.0, a history of when a command, its keywords, and its variables were introduced or added Use with the JUNOSe configuration guides.
JUNOSe Comprehensive Index	Provides a complete index of the JUNOSe software documentation set.
JUNOSe Glossary	Provides definitions for terms used in JUNOSe technical documentation.
Release Notes	
JUNOSe Release Notes	Provide the latest information about features, changes, known problems, resolved problems, and system maximum values. If the information in the *Release Notes* differs from the information found in the documentation set, follow the *Release Notes*. Release notes are included on the corresponding software CD and are available on the Web.

JUNOSe Configuration Guides

JUNOSe software configuration guides use a bottom-up approach to describe the relationship of layers, protocols, and interfaces in the configuration process. For more information, see *Layered Approach* in *JUNOSe System Basics Configuration Guide, Chapter 1, Planning Your Network*.

The chapters in JUNOSe software configuration guides typically include the following topics:

- Conceptual and overview information
- Information you need to know or tasks you need to perform before you begin
- Platform-specific issues you need to take into consideration
- Applicable references, such as RFCs and IETF draft documents, about the protocols and features supported by the router
- Required and optional tasks, as step-by-step procedures
- Descriptions and examples of the commands you use
- Illustrations of network topologies
- Examples of command sequences for configuration, testing, and monitoring activities
- Sample displays that result when you issue the **show** command

Obtaining Documentation

To obtain the most current version of all Juniper Networks technical documentation, see the products documentation page on the Juniper Networks Web site at http://www.juniper.net/.

To order a documentation CD, which contains this manual, contact your sales representative.

Copies of the Management Information Bases (MIBs) available in a software release are included on the software CDs and at http://www.juniper.net/.

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We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation to better meet your needs. Send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at http://www.juniper.net/techpubs/docbug/docbugreport.html. 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

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 post-sales 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/
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- 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 Manager: 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

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- Use the Case Manager 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 http://www.juniper.net/support/requesting-support.html

Part 1

Managing Remote Access

Chapter 1

Configuring Remote Access

This chapter describes how to configure remote access to an E-series router. This chapter discusses the following topics:

Overview

Broadband Remote Access Server (B-RAS) is an application running on your router that:

- Aggregates the output from digital subscriber line access multiplexers (DSLAMs)
- Provides user Point-to-Point Protocol (PPP) sessions or IP-over-Asynchronous Transfer Mode (ATM) sessions
- Enforces quality of service (QoS) policies
- Routes traffic into an Internet service provider's (ISP's) backbone network

A DSLAM collects data traffic from multiple subscribers into a centralized point so that it can be uploaded to the router over an ATM connection via a DS3, OC3, E3, or OC12 link.

The router provides the logical termination for PPP sessions, as well as the interface to authentication and accounting systems.

B-RAS Data Flow

The router performs several tasks for a digital subscriber line (DSL) PPP user to establish a PPP connection. This is an example of the way B-RAS data might flow:

1. Authenticate the subscriber using RADIUS authentication.
2. Assign an IP address to the PPP/IP session via RADIUS, local address pools, or Dynamic Host Configuration Protocol (DHCP).
3. Terminate the PPP encapsulation or tunnel a PPP session.
4. Provide user accounting via RADIUS.

NOTE: For information about configuring RADIUS attributes see *Chapter 3, Configuring RADIUS Attributes*.

Configuring IP Addresses for Remote Clients

A remote client can obtain an IP address from one of the following:

- RADIUS server
- Local address server
- DHCP proxy client and server
- DHCP relay agent (Bridged IP only)
- DHCP local server
- DHCP external server

For information about configuring DHCP support on the E-series router, see *Managing DHCP* on page 391.

For information about how to configure a RADIUS server, see your RADIUS server documentation.

AAA Overview

Collectively, authentication, authorization, and accounting are referred to as AAA. Each has an important but separate function.

- Authentication—Determines who the user is, then determines whether that user should be granted access to the network. The primary purpose is to prevent intruders from networks. It uses a database of users and passwords.
- Authorization—Determines what the user is allowed to do by giving network managers the ability to limit network services to different users.
- Accounting—Tracks what the user did and when they did it. You can use accounting for an audit trail or for billing for connection time or resources used.

Central management of AAA means the information is in a single, centralized, secure database, which is much easier to administer than information distributed across numerous devices.

Platform Considerations

B-RAS services are supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

B-RAS Protocol Support

The E-series router supports the following protocols for B-RAS services:

- PPP
- PPP over Ethernet (PPPoE)
- Bridged Ethernet
- Layer 2 Tunneling Protocol (L2TP), both L2TP access concentrator (LAC) and L2TP network server (LNS)

References

For more information about the topics covered in this chapter, see the following documents:

- RFC 2748—The COPS (Common Open Policy Service) Protocol (January 2000)
- RFC 2865—Remote Authentication Dial In User Service (RADIUS) (June 2000)
- RFC 3084—COPS Usage for Policy Provisioning (COPS-PR) (March 2001)
- RFC 3159—Structure of Policy Provisioning Information (SPPI) (August 2001)
- RFC 3198—Terminology for Policy-Based Management (November 2001)
- RFC 3318—Framework Policy Information Base (March 2003)

JUNOSe Release Notes, *Appendix A*, *System Maximums*—Refer to the Release Notes corresponding to your software release for information about the number of concurrent RADIUS requests that the router supports for authentication and accounting servers.

Before You Configure B-RAS

Before you begin to configure B-RAS, you need to collect the following information for the RADIUS authentication and accounting servers:

- IP addresses
- User Datagram Protocol (UDP) port numbers
- Secret keys

Configuration Tasks

Each configuration task is presented in a separate section in this chapter. Most of the B-RAS configuration tasks are optional.

To configure B-RAS, perform the following tasks:

1. Configure a B-RAS license.
2. (Optional) Map a user domain name to a virtual router. By default, all requests go through a default router.
3. (Optional) Set up domain name and realm name usage.
4. (Optional) Specify a single name for users from a domain.
5. Configure an authentication server on the router.
6. (Optional) Configure UDP checksums.
7. (Optional) Configure an accounting server on the router.
8. (Optional) Configure Domain Name System (DNS) and Windows Internet Name Service (WINS) name server addresses.
9. (Optional) Configure a local address pool for remote clients.
10. (Optional) Configure one or more DHCP servers.
11. Create a PPP interface on which the router can dynamically create an IP interface.
12. (Optional) Configure AAA profiles.
13. (Optional) Use vendor-specific attributes (VSAs) for Dynamic Interfaces.
14. (Optional) Set idle or session timeout.
15. (Optional) Limit the number of active subscribers on a virtual router (VR) or port.
16. (Optional) Set up the router to notify RADIUS when a user fails AAA.
17. (Optional) Configure a RADIUS download server on the router.
18. (Optional) Configure the Session and Resource Control (SRC) client (formerly the SDX client).
19. (Optional) Set baselines for AAA statistics or RADIUS authentication and accounting statistics.

Configuring a B-RAS License

From Global Configuration mode, configure a B-RAS license:

```
host1(config)#license b-ras k3n91s6gvtj
```

B-RAS licenses are available in various sizes to enable subscriber access for up to one of the following maximum number of simultaneous active IP, LAC, and bridged Ethernet interfaces:

- 4000
- 8000
- 16,000
- 32,000
- 48,000

NOTE: To use a B-RAS license for 16,000 or more interfaces, each of your SRP modules must have 1 gigabyte (GB) of memory.

license b-ras

- Use to specify the B-RAS license.
- The license is a unique string of up to 15 alphanumeric characters.

NOTE: Acquire the license from Juniper Networks Customer Service or your Juniper Networks sales representative.

- You can purchase licenses that allow up to 2,000, 4,000, 8,000, 16,000, 32,000, or 48,000 simultaneous active IP, LAC, and bridged Ethernet interfaces.
- Example

  ```
  host1(config)#license b-ras jwmR4k8D
  ```

- Use the **no** version to disable the license.

Mapping a User Domain Name to a Virtual Router

You can configure RADIUS authentication, accounting, and local address pools for a specific virtual router and then map a user domain to that virtual router.

The router keeps track of the mapping between domain names and virtual-routers. Use the **aaa domain-map** command to map a user domain to a virtual router.

NOTE: This domain name is not the NT domain sometimes found on the Dialup Networking dialog box.

When the router is configured to require authentication of a PPP user, the router checks for the appropriate user domain-name-to-virtual-router mapping. If it finds a match, the router sends a RADIUS authentication request to the RADIUS server configured for the specific virtual router.

Mapping User Requests Without a Valid Domain Name

You can create a mapping between a domain name called **default** and a specific virtual router so that the router can map user names that contain a domain name that does not have an explicit map.

If a user request is submitted with a domain name for which the router cannot find a match, the router looks for a mapping between the domain name **default** and a virtual router. If a match is found, the user's request is processed according to the RADIUS server configured for the named virtual router. If no entry is found that maps **default** to a specific virtual router, the router sends the request to the RADIUS server configured on the default virtual router.

Mapping User Requests Without a Configured Domain Name

You can map a domain name called **none** to a specific virtual router so that the router can map user names that do not contain a domain name.

If a user request is submitted without a domain name, the router looks for a mapping between the domain name **none** and a virtual router. If a match is found, the user's request is processed according to the RADIUS server configured for the named virtual router. If the router does not find the domain name **none**, it checks for the domain name **default**. If no matching entries are found, the router sends the request to the server configured on the default virtual router.

Using DNIS

The E-series router supports dialed number identification service (DNIS). With DNIS, if users have a called number associated with them, the router searches the domain map for the called number. If it finds a match, the router uses the matching domain map entry information to authenticate the user. If the router does not find a match, it searches the domain map using normal processing.

NOTE: For DNIS to work, the router must be acting as the LNS. Also, the phone number configured in the **aaa domain-map** command must be an exact match to the value passed by L2TP in the called number AVP (AVP 21).

For example, as specified in the following sequence, a user calling 9785551212 would be terminated in vrouter_88, while a user calling 8005554433 is terminated in vrouter_100.

```
host1(config)#aaa domain-map 9785551212 vrouter_88
host1(config)#aaa domain-map 8005554433 vrouter_100
```

Redirected Authentication

Redirected authentication provides a way to offload AAA activity on the router, by providing the domain-mapping-like feature remotely on the RADIUS server. Redirected authentication works as follows:

1. The router sends an authentication request (in the form of a RADIUS access-request message) to the RADIUS server that is configured in the default VR.

2. The RADIUS server determines the user's AAA VR context and returns this information in a RADIUS response message to the router.

3. The router then behaves in similar fashion as if it had received the VR context from the local domain map.

NOTE: If the default VR does not exist, authentication fails.

To maintain local control, the only VR allowed to redirect authentication is the default VR. Also, to prevent loopbacks, the redirection may occur only once to a non-default VR.

To maintain flexibility, the redirection response may include idle time or session attributes that are considered as default unless the redirected authentication server overrides them. For example, if the RADIUS server returns the VR context along with an idle timeout attribute with the value set to 20 minutes, the router uses this idle timeout value unless the RADIUS server configured in the VR context returns a different value.

Since the router supports the RADIUS User-Name attribute [1] in the RADIUS response message, the default VR RADIUS server may override the user's name (this can be a stripped name or an entirely different name). Overriding is useful for the case when the user enters a login name containing a domain name that is significant only to the RADIUS server in the default VR.

IP Hinting

You can allocate an address before authentication of PPP sessions. This address is included in the Access-Request sent to the authentication server as an IP address hint.

aaa domain-map

- Use to map a user domain name to a virtual router or a loopback interface.
- When you specify only the domain name, the command sets the mode to Domain Map Configuration.
- Example

  host1(config)#**aaa domain-map juniper.net vrouter_1**
  host1(config)#**aaa domain-map none vrouter_all_purpose**
  host1(config)#**aaa domain-map default vrouter_all_purpose**
  host1(config)#**aaa domain-map 8005558934 vrouter_78**
  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#

- Use the **no** version to delete the map entry.

ip-hint

- Use to preallocate an IP address for the remote B-RAS user before authenticating the remote user.
- The address is passed as a *hint* in the authentication request.
- Example

  host1(config-domain-map)#**ip-hint enable**

- Use the **no** version to disable the feature.

ipv6-local-interface

- Use to map a user domain name to an IP version 6 (IPv6) loopback interface.
- The local interface identifies the interface information to use on the local (E-series) side of the subscriber's interface.
- Example

  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#**ipv6-local-interface 2001:db8::8000**

- Use the **no** version to delete the entry.

ipv6-router-name

- Use to map a user domain name to an IPv6 virtual router in Domain Map Configuration mode.
- Example

  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#**ipv6-router-name vroutv6**

- Use the **no** version to delete the entry.

local-interface

- Use to map a user domain name to a loopback interface.
- The local interface identifies the interface information to use on the local (E-series) side of the subscriber's interface.
- Example

  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#**local-interface 10.10.5.30**

- Use the **no** version to delete the entry.

router-name

- Use to map a user domain name to a virtual router.
- Example

  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#**router-name vrout**

- Use the **no** version to delete the entry.

Setting Up Domain Name and Realm Name Usage

To provide flexibility in how the router handles different types of usernames, the software lets you specify the part of a username to use as the domain name, how the domain name is designated, and how the router parses names. It also allows you to set whether or not the router strips the domain name from the username before it sends the username to the RADIUS server.

By default, the router parses usernames as follows:

realmName/personalName@domainName

The string to the left of the forward slash (/) is the realm name, and the string to the right of the at-symbol (@) is the domain name. For example, in the username juniper/jill@abc.com, juniper is the realm name and abc.com is the domain name.

The router allows you to:

- Use the realm name as the domain name.
- Use delimiters other than / to designate the realm name.
- Use delimiters other than @ to designate the domain name.
- Use either the domain or the realm as the domain name when the username contains both a realm and domain name.
- Change the direction in which the router searches for the domain name or the realm name.

To provide these features, the router allows you to specify delimiters for the domain name and realm name. You can use up to eight one-character delimiters each for domain and realm names. The router also lets you specify how it parses usernames to determine which part of a username to use as the domain name.

Using the Realm Name as the Domain Name

Typically, a realm appears before the user field and is separated with the / character; for example, usEast/jill@abc.com. To use the realm name usEast rather than abc.com as the domain name, set the realm name delimiter to /. For example:

```
host1(config)#aaa delimiter realmName /
```

This command causes the router to use the string to the left of the / as the domain name. If the realm name delimiter is null (the default), the router will not search for the realm name.

Using Delimiters Other Than @

You can set up the router to recognize delimiters other than @ to designate the domain name. Suppose there are two users: bob@abc.com and pete!xyz.com, and you want to use both of their domain names. In this case you would set the domain name delimiter to @ and !. For example:

```
host1(config)#aaa delimiter domainName @!
```

Using Either the Domain or the Realm as the Domain Name

If the username contains both a realm name and a domain name delimiter, you can use either the domain name or the realm name as the domain name. As previously mentioned, the router treats usernames with multiple delimiters as though the realm name is to the left of the realm delimiter and the domain name is to the right of the domain delimiter.

If you set the parse order to:

- domain-first—The router searches for a domain name first. For example, for username usEast/lori@abc.com, the domain name is abc.com.
- realm-first—The router searches for a realm name first and uses the realm name as the user's domain name. For username usEast/lori@abc.com, the domain is usEast.

For example, if you set the delimiter for the realm name to / and set the delimiter for the domain name to @, the router parses the realm first by default. The username usEast/lori@abc.com results in a domain name of usEast. To cause the parsing to return abc.com as the domain, enter the **aaa parse-order domain-first** command.

Specifying the Domain Name or Realm Name Parse Direction

You can specify the direction—either left to right or right to left—in which the router performs the parsing operation when identifying the realm name or domain name. This feature is particularly useful if the username contains nested realm or domain names. For example, for a username of userjohn@abc.com@xyz.com, you can identify the domain as either abc.com@xyz.com or as xyz.com, depending on the parse direction that you specify.

You use either the **left-to-right** or **right-to-left** keywords with one of the following keywords to specify the type of search and parsing that the router performs:

- **domainName**—The router searches for the next domain delimiter value in the direction specified. When it reaches a delimiter, the router uses anything to the right of the delimiter as the domain name. Domain parsing is from right to left by default.
- **realmName**—The router searches for the next realm delimiter value in the direction specified. When it reaches a delimiter, the router uses anything to the left of the delimiter as the realm name. Realm parsing is from left to right by default.
- Example

  host1(config)#**aaa parse-direction domainName left-to-right**

Stripping the Domain Name

The router provides feature that strips the domain name from the username before it sends the name to the RADIUS server in an Access-Request message. You can enable or disable this feature using the **strip-domain** command.

By default, the domain name is the text after the last @ character. However, if you changed the domain name parsing using the **aaa delimiter**, **aaa parse-order**, or **aaa parse direction** commands, the router strips the domain name and delimiter that result from the parsing.

aaa delimiter

- Use to configure delimiters for the domain and realm names. Specify one of the following keywords:
  - **domainName**—Configures domain name delimiters. The default domain name delimiter is @.
  - **realmName**—Configures realm name delimiters. The default realm name delimiter is NULL (no character). In this case, realm parsing is disabled (having no delimiter disables realm parsing).
- You can specify up to eight delimiters each for domain name and realm name.
- Example

  host1(config)#**aaa delimiter domainName @*/**

- Use the **no** version to return to the default.

aaa parse-direction

- Use to specify the direction the router uses to parse the username for the domain or realm name.
  - **domainName**—Specifies that the domain name is parsed. The router performs domain parsing from right to left by default.
  - **realmName**—Specifies that the realm name is parsed. The router performs realm parsing from left to right by default.
  - **left-to-right**—Router searches from the left-most character. When the router reaches a realm delimiter, it uses anything to the left of the delimiter as the domain. When the router reaches a domain delimiter, it uses anything to the right of the delimiter as the domain.
  - **right-to-left**—Router searches from the right-most character. When the router reaches a realm delimiter, it uses anything to the left of the delimiter as the domain. When the router reaches a domain delimiter, it uses anything to the right of the delimiter as the domain.
- Example

  host1(config)#**aaa parse-direction domainName left-to-right**

- Use the **no** version to return to the default: right-to-left parsing for domain names and left-to-right parsing for realm names.

aaa parse-order

- Use to specify which part of a username the router uses as the domain name. If a user's name contains both a realm name and a domain name, you can configure the router to use either name as the domain name.
  - **domain-first**—Router searches for a domain name first. When the router reaches a domain delimiter, it uses anything to the right of the delimiter as the domain name. For example, if the username is usEast/lori@abc.com, the domain name is abc.com. If the router does not find a domain name, it then searches for a realm name if the realm delimiter is specified.
  - **realm-first**—Router searches for a realm name first. When the router reaches a realm delimiter, it uses anything to the left of the delimiter as the domain. For example, if the username is usEast/lori@abc.com, the domain name is usEast. If no realm name is found, the router searches for a domain name.
- Example

  host1(config)#**aaa parse-order domain-first**

- Use the **no** version to return to the default, realm first.

strip-domain

- Use to strip the domain name from the username before sending an access-request message to the RADIUS server.
- By default, the domain name is the text after the last @ character. However, if you change the domain name parsing by using the **aaa delimiter**, **aaa parse-order**, or **parse-direction** command, the router strips the domain name and delimiter that result from the parsing.
- To stop stripping the username, use the **disable** keyword.
- Example

  host1(config)#**aaa domain-map xyz.com**
  host1(config-domain-map)#**strip-domain enable**

- Use the **no** version to return to the default, disabled.

Domain Name and Realm Name Examples

This section provides examples of possible domain or realm name results that you might obtain, depending on the commands and options you specify. This example uses the following username:

username: usEast/userjohn@abc.com@xyz.com

The router is configured with the following commands:

host1(config)#**aaa delimiter domainName @!**
host1(config)#**aaa delimiter realmName /**

Table 4 shows the username and domain name that result from the parsing action of the various commands.

Table 4: Username and Domain Name Examples

Command	Resulting Username	Resulting Domain Name
aaa parse-order realm-first	userjohn@abc.com@xyz.com	usEast
aaa parse-order domain-first	userjohn@abc.com	xyz.com
aaa parse-direction domainName right-to-left	userjohn@abc.com	xyz.com
aaa parse-direction domainName left-to-right	userjohn	abc.com@xyz.com
aaa parse-direction realmName right-to-left	userjohn@abc.com@xyz.com	usEast
aaa parse-direction realmName left-to-right	userjohn@abc.com@xyz.com	usEast

Specifying a Single Name for Users from a Domain

Assigning a single username and a single password for all users associated with a domain provides better compatibility with some RADIUS servers. You can use this feature for domains that require the router to tunnel, but not terminate, PPP sessions.

When users request a PPP session, they specify usernames and passwords. During the negotiations for the PPP session, the router authenticates legitimate users.

NOTE: This feature works only for users authenticated by Password Authentication Protocol (PAP) and not by Challenge Handshake Authentication Protocol (CHAP).

If you configure this feature, the router substitutes the specified username and password for all authenticated usernames and passwords associated with that domain.

There are two options for this feature. The router can:

- Substitute the domain name for each username and one new password for each existing password.

  For example, if the domain name is xyz.com and you specify the password xyz_domain, the router associates the username xyz.com and the password xyz_domain with all users from xyz.com.

- Substitute one new username for each username and one new password for each existing password.

  For example, if the domain name is xyz.com and you specify the username xyz_group and the password xyz_domain, the router associates these identifiers with all users from xyz.com.

To use a single username and a single password for all users from a domain:

1. Access Domain Map Configuration mode using the **aaa domain-map** command.
2. Specify the new username and password using the **override-user** command.

aaa domain-map

- Use to map a domain name to a virtual router or to access Domain Map Configuration mode.
- Example

  host1(config)#**aaa domain-map xyz.com**
  host1(config-domain-map)#

- Use the **no** version to delete the map entry.

override-user

- Use to specify a single username and single password for all users from a domain in place of the values received from the remote client.
- Use only for domains that require the router to tunnel and not terminate PPP sessions.
- If you specify a password only, the router substitutes the domain name for the username and associates the new password with the user. If you specify a password only and you have configured the domain name *none* with the **aaa domain-map** command, the router rejects any users without domain names.
- If you specify a name and password, the router associates both the new name and password with the user.
- Example

  host1(config-domain-map)#**override-user name boston password abc**

- Use the **no** version to revert to the original username.

Configuring RADIUS Authentication and Accounting Servers

The number of RADIUS servers you can configure depends on available memory.

The order in which you configure servers determines the order in which the router contacts those servers on behalf of clients.

Initially, a RADIUS client sends a request to a RADIUS authentication or accounting server. The RADIUS server uses the configured IP address, the UDP port number, and the secret key to make the connection. The RADIUS client waits for a response for a configurable timeout period and then retransmits the request. The RADIUS client retransmits the request for a user-configurable retry limit.

- If there is no response from the primary RADIUS server, the RADIUS client submits the request to the secondary RADIUS server using the timeout period and retry limit configured for the secondary RADIUS server.
- If the connection attempt fails for the secondary RADIUS server, the router submits the request to the tertiary server and so on until it either is granted access on behalf of the client or there are no more configured servers.
- If another authentication server is not configured, the router attempts the next method in the method list; for accounting server requests, the information is dropped.

For example, suppose that you have configured the following authentication servers: Auth1, Auth2, Auth3, Auth4, and Auth5. Your router attempts to send an authentication request to Auth1. If Auth1 is unavailable, the router submits the request to Auth2, then Auth3, and so on until an available server is found. If Auth5, the last configured authentication server, is not available, the router attempts the next method in the methods list. If the only method configured is RADIUS, then the router notifies the client that the request has been denied.

Server Access

The router offers two options by which servers are accessed:

- Direct—The first authentication or accounting server that you configure is treated as the primary authentication or accounting server, the next server configured is the secondary, and so on.
- Round-robin—The first configured server is treated as a primary for the first request, the second server configured as primary for the second request, and so on. When the router reaches the end of the list of servers, it starts again at the top of the list until it comes full cycle through the list.

Use the **radius algorithm** command to specify the server access method.

When you configure the first RADIUS accounting server, a RADIUS Acct-On message is sent. When you delete the last accounting server, a RADIUS Acct-Off message is sent.

Server Request Processing Limit

You can configure RADIUS authentication servers and accounting servers to use different UDP ports on the router. This enables the same IP address to be used for both an authentication server and an accounting server. However, you cannot use the same IP address for multiple authentication servers or for multiple accounting servers.rs.

NOTE: For information about the number of concurrent RADIUS requests that the router supports for authentication and accounting servers, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

The E-series router listens to a range of UDP source (or local) ports for RADIUS responses. Each UDP source port supports a maximum of 255 RADIUS requests. When the 255 per-port limit is reached, the router opens the next source port. When the **max-sessions** command limit is reached, the router submits the request to the next configured server.

Table 5 lists the range of UDP ports the router uses for each type of RADIUS request.

Table 5: Local UDP Port Ranges by RADIUS Request Type

RADIUS Request Type	ERX-310, ERX-710, ERX-1410, and E120 Routers	ERX-1440 and E320 Routers
RADIUS authentication	50000–50124	50000–50124
RADIUS accounting	50125–50249	50125–50499
RADIUS preauthentication	50250–50374	50500–50624
RADIUS route-download	50375–50500	50625–50749

Authentication and Accounting Methods

When you configure AAA authentication and accounting services for your B-RAS environment, one important task is to specify the authentication and accounting method used. The JUNOSe software gives you the flexibility to configure authentication or accounting methods based on the type of subscriber. This feature allows you to enable RADIUS authentication for some subscribers, while disabling authentication completely for other subscribers. Similarly, you can enable RADIUS accounting for some subscribers, but no accounting for others. For example, you might use RADIUS authentication for ATM 1483 subscribers, while granting IP subscriber management interfaces access without authentication (using the **none** keyword).

You can specify the authentication or accounting method you want to use, or you can specify multiple methods in the order in which you want them used. For example, if you specify the **radius** keyword followed by the **none** keyword when configuring authentication, AAA initially attempts to use RADIUS authentication. If no RADIUS servers are available, AAA uses no authentication. The JUNOSe software currently supports **radius** and **none** as accounting methods and **radius**, **none**, and **local** as authentication methods. See *Configuring Local Authentication Servers* on page 39 for information about local authentication.

You can configure authentication and accounting methods based on the following types of subscribers:

- ATM 1483
- Tunnels (for example, L2TP tunnels)
- PPP
- RADIUS relay server
- IP subscriber management interfaces

NOTE: IP subscriber management interfaces are static or dynamic interfaces that are created or managed by the JUNOSe software's subscriber management feature.

Supporting Exchange of Extensible Authentication Protocol Messages

Extensible Authentication Protocol (EAP) is a protocol that supports multiple methods for authenticating a peer before allowing network layer protocols to transmit over the link. JUNOSe software supports the exchange of EAP messages between JUNOSe applications, such as PPP, and an external RADIUS authentication server.

The JUNOSe software's AAA service accepts and passes EAP messages between the JUNOSe application and the router's internal RADIUS authentication server. The internal RADIUS authentication server, which is a RADIUS client, provides EAP pass-through—the RADIUS client accepts the EAP messages from AAA, and sends the messages to the external RADIUS server for authentication. The RADIUS client then passes the response from the external RADIUS authentication server back to the AAA service, which then sends a response to the JUNOSe application. The AAA service and the internal RADIUS authentication service do not process EAP information—both simply act as pass-through devices for the EAP message.

The router's local authentication server and TACACS+ authentication servers do not support the exchange of EAP messages. These type of servers deny access if they receive an authentication request from AAA that includes an EAP message. EAP messages do not affect the **none** authentication configuration, which always grants access.

The local RADIUS authentication server uses the following RADIUS attributes when exchanging EAP messages with the external RADIUS authentication server:

- Framed-MTU (attribute 12)—Used if AAA passes an MTU value to the internal RADIUS client
- State (attribute 24)—Used in Challenge-Response messages from the external server and returned to the external server on the subsequent Access-Request
- Session-Timeout (attribute 27)—Used in Challenge-Response messages from the external server
- EAP-Message (attribute 79)—Used to fragment EAP strings into 253-byte fragments (the RADIUS limit)
- Message-Authenticator (attribute 80)—Used to authenticate messages that include an EAP-Message attribute

For additional information on configuring PPP to use EAP authentication, see *Extensible Authentication Protocol* in *JUNOSe Link Layer Configuration Guide, Chapter 7, Configuring Point-to-Point Protocol*.

Immediate Accounting Updates

You can use the **aaa accounting immediate-update** command to configure immediate accounting updates on a per-VR basis. If you enable this feature, the E-series router sends an Acct-Update message to the accounting server immediately on receipt of a response (ACK or timeout) to the Acct-Start message.

This feature is disabled by default. Use the **enable** keyword to enable immediate updates and the **disable** keyword to halt them.

The accounting update contains 0 (zero) values for the input/output octets/packets and 0 (zero) for uptime. If you have enabled duplicate or broadcast accounting, the accounting update goes to both the primary virtual router context and the duplicate or broadcast virtual router context.

Duplicate and Broadcast Accounting

Normally, the JUNOSe software sends subscriber-related AAA accounting information to the virtual router that authenticates the subscriber. If an operational virtual router is configured that is different from the authentication router, it also receives the accounting information. You can optionally configure duplicate or broadcast AAA accounting, which sends the accounting information to additional virtual routers simultaneously. The accounting information continues to be sent to the authenticating virtual router, but not to the operational virtual router.

Both the duplicate and broadcast accounting features are supported on a per-virtual router context, and enable you to specify particular accounting servers that you want to receive the accounting information.

For example, you might use broadcast accounting to send accounting information to a group of your private accounting servers. Or you might use duplicate accounting to send the accounting information to a customer's accounting server.

- Duplicate accounting—Sends the accounting information to a particular virtual router

- Broadcast accounting—Sends the accounting information to a group of virtual routers. An accounting virtual router group can contain up to four virtual routers and the E-series router supports a maximum of 100 virtual router groups. The accounting information continues to be sent to the duplicate accounting virtual router, if one is configured.

Configuring AAA Duplicate Accounting

To configure and enable duplicate accounting on a virtual router, you use the **aaa accounting duplication** command with the name of the accounting server that will receive the information. For example, to enable duplicate accounting for the default virtual router:

```
host1(config)#aaa accounting duplication xyzCompanyServer
```

Configuring AAA Broadcast Accounting

To configure and enable broadcast accounting on a virtual router:

1. Create the virtual router group and enter VR Group Configuration mode:

   ```
   host1(config)#aaa accounting vr-group groupXyzCompany
   host1(vr-group-config)#
   ```

2. Add up to four virtual routers to the group. The accounting information will be sent to all virtual routers in the group.

   ```
   host1(vr-group-config)#aaa virtual-router 1 vrXyz1
   host1(vr-group-config)#aaa virtual-router 2 vrXyz2
   host1(vr-group-config)#aaa virtual-router 3 vrXyz3
   host1(vr-group-config)#exit
   host1(config)#
   ```

3. Enable broadcast accounting. Enter the correct virtual router context, and specify the virtual router group whose virtual routers will receive the accounting information.

```
host1(config)#virtual-router opVr100
host1:opVr100(config)#aaa accounting broadcast groupXyzCompany
```

Overriding AAA Accounting NAS Information

AAA accounting packets normally include two RADIUS attributes—NAS-IP-Address [4] and NAS-Identifier [32]—of the virtual router that generates the accounting information. You can override the default configuration and specify that accounting packets from particular broadcast virtual routers instead include the NAS-IP-Address and NAS-Identifier attributes of the authenticating virtual router.

To override the normal AAA accounting NAS information, access the correct virtual router context, and use the **radius override nas-info** command. For example:

```
host1(config)#virtual-router vrXyz1
host1:vrXyz1(config)#radius override nas-info
host1:vrXyz1(config)#virtual-router vrXyz2
host1:vrXyz2(config)#radius override nas-info
host1:vrXyz3(config)#exit
host1(config)#
```

UDP Checksums

Each virtual router on which you configure B-RAS is enabled to perform UDP checksums by default. You can disable and reenable UDP checksums.

Collecting Accounting Statistics

You can use the **aaa accounting statistics** command to specify how the AAA server collects statistics on the sessions it manages. Use the **volume-time** keyword to specify that AAA notifies applications to collect a full set of statistics from each of their connections. Use the **time** keyword to specify that only the uptime status is collected for each connection. Collecting only uptime information reduces the amount of data sent to AAA and is a more efficient use of system resources for customers that do not need a full set of statistics. The router collects a full set of statistics by default.

Configuring RADIUS AAA Servers

The number of RADIUS servers you can configure depends on available memory. The router has an embedded RADIUS client for authentication and accounting.

NOTE: You can configure B-RAS with RADIUS accounting, but without RADIUS authentication. In this configuration, the username and password on the remote end are not authenticated and can be set to any value.

You must assign an IP address to a RADIUS authentication or accounting server to configure it.

If you do not configure a primary authentication or accounting server, all authentication and accounting requests will fail. You can configure other servers as backup in the event that the primary server cannot be reached. Configure each server individually.

To configure an authentication or accounting RADIUS server:

1. Specify the authentication or accounting server address.

   host1(config)#**radius authentication server 10.10.10.1**
   host1(config-radius)#
   or
   host1(config)#**radius accounting server 10.10.10.6**
   host1(config-radius)#

2. (Optional) Specify a UDP port for RADIUS authentication or accounting server requests.

   host1(config-radius)#**udp-port 1645**

3. Specify an authentication or accounting server secret.

   host1(config-radius)#**key gismo**

4. (Optional) Specify the number of retries the router makes to an authentication or accounting server before it attempts to contact another server.

   host1(config-radius)#**retransmit 2**

5. (Optional) Specify the number of seconds between retries.

   host1(config-radius)#**timeout 5**

6. (Optional) Specify the maximum number of outstanding requests.

   host1(config-radius)#**max-sessions 100**

7. (Optional) Specify the amount of time to remove a server from the available list when a timeout occurs.

   host1(config-radius)#**deadtime 10**

8. (Optional) In Global Configuration mode, specify whether the E-series router should move on to the next RADIUS server when the router receives an Access-Reject message for the user it is authenticating.

   host1(config)#**radius rollover-on-reject enable**

9. (Optional) Enable duplicate address checking.

   host1(config)**aaa duplicate-address-check enable**

10. (Optional) Specify that duplicate accounting records be sent to the accounting server for a virtual router.

    host1(config)#**aaa accounting duplication routerBoston**

11. (Optional) Enter the correct virtual router context, and specify the virtual router group to which broadcast accounting records are sent.

    host1(config)#**virtual-router vrSouth25**
    host1:vrSouth25(config)#**aaa accounting broadcast westVrGroup38**
    host1:vrSouth25(config)#**exit**

12. (Optional) Specify that immediate accounting updates be sent to the accounting server when a response is received to an Acct-Start message.

    host1(config)#**aaa accounting immediate-update**

13. (Optional) Specify whether the router collects all statistics or only the uptime status.

    host1(config)#**aaa accounting time**

14. (Optional) Specify that tunnel accounting be enabled or disabled.

    host1(config)#**radius tunnel-accounting enable**

15. (Optional) Specify the default authentication and accounting methods for the subscribers.

    host1(config)#**aaa authentication ppp default radius none**

16. (Optional) Disable UDP checksums on virtual routers you configure for B-RAS.

    host1:(config)#**virtual router boston**
    host1:boston(config)#**radius udp-checksum disable**

aaa accounting broadcast

- Use to enable AAA broadcast accounting on a virtual router. Specifies that accounting records be sent to the accounting servers on the virtual routers in the named virtual router group.
- A virtual router group can be used in any virtual router context, not just the context in which it is created.
- Example

  host1(config)#**virtual-router vrSouth25**
  host1:vrSouth25(config)#**aaa accounting broadcast westVrGroup38**
  host1:vrSouth25(config)#**exit**

- Use the **no** version to disable the AAA broadcast accounting.

aaa accounting default

- Use to specify the accounting method used for a particular type of subscriber.
- Specify one of the following types of subscribers:
  - **atm1483**; this keyword is not supported
  - **tunnel**
  - **ppp**
  - **radius-relay**
  - **ipsec**
  - **ip** (IP subscriber management interfaces)

NOTE: IP subscriber management interfaces are static or dynamic interfaces that are created or managed by the JUNOSe software's subscriber management feature.

NOTE: Although the **atm1483** keyword is available in the CLI for this command, that subscriber type is not supported. The router does not support accounting for ATM 1483 subscribers.

- Specify one of the following types of accounting methods:
  - **radius**—RADIUS accounting for the specified subscribers.
  - **none**—No accounting is done for the specified subscribers.
  - **radius none**—Multiple types of accounting; used in the order specified. For example, **radius none** specifies that RADIUS accounting is initially used; however, if RADIUS servers are not available, no accounting is done.
- Example

  host1(config)#**aaa accounting ppp default radius**

- Use the **no** version to set the accounting protocol to the default, **radius**.

aaa accounting duplication

- Use to enable AAA duplicate accounting on a virtual router. Specifies that duplicate accounting records be sent to the accounting server on another virtual router.
- Example

  host1(config)#**aaa accounting duplication routerBoston**

- Use the **no** version to disable the feature.

aaa accounting immediate-update

- Use to send an accounting update to the accounting server immediately on receipt of a response for an Acct-Start message.
- Use the **enable** keyword to enable immediate updates. Use the **disable** keyword to disable immediate updates. Immediate updates are disabled by default.
- Example

  host1(config)#**aaa accounting immediate-update enable**

- Use the **no** version to restore the default condition, disabling immediate updates.

aaa accounting interval

- Use to specify the default interval between updates for user and service interim accounting.

NOTE: This command is deprecated and might be removed completely in a future release. Use the **aaa user accounting interval** command to specify the default interval for user accounting. Use the **aaa service accounting interval** command to specify the default interim accounting interval used for services created by the Service Manager application. See *Chapter 27, Configuring Service Manager*.

- Select an interval in the range 10–1440 minutes. The default is 0, which means that the feature is disabled.
- Example

  host1(config)#**aaa accounting interval 60**

- Use the **no** version to turn off interim accounting for both users and services.

aaa accounting statistics

- Use to specify how the AAA server collects statistics on the sessions it manages.
- Use the **volume-time** keyword to collect all statistics for the sessions.
- Use the **time** keyword to collect only the uptime status of the sessions. Collecting only uptime information is more efficient because less data is sent to AAA.
- Example

  host1(config)#**aaa accounting statistics time**

- Use the **no** version to restore the default, in which all statistics are collected.

aaa accounting vr-group

- Use to create an accounting virtual router group and enter VR Group Configuration mode. Virtual routing groups are used for AAA broadcast accounting.
- A virtual router group can have up to four virtual routers. The accounting servers of the virtual routers in the group receive broadcast accounting records that are forwarded to the group.

- The E-series router supports a maximum of 100 virtual router groups.
- When creating a virtual router group, you must add at least one virtual router to the group; otherwise, the group is not created.
- A virtual router group can be used in any virtual router context, not just the context in which it is created.
- Example

  host1(config)#**aaa accounting vr-group westVrGroup38**
  host1(config-vr-group)#

- Use the **no** version to delete the accounting virtual router group.

aaa authentication default

- Use to specify the authentication method used for a particular type of subscriber.
- Specify one of the following types of subscribers:
  - **atm1483**
  - **tunnel**
  - **ppp**
  - **radius-relay**
  - **ipsec**
  - **ip** (IP subscriber management interfaces)

NOTE: IP subscriber management interfaces are static or dynamic interfaces that are created or managed by the JUNOSe software's subscriber management feature.

- Specify one of the following types of accounting methods:
  - **radius**—RADIUS authentication for the specified subscribers.
  - **none**—Grants the specified subscribers access without authentication.
  - **radius none**—Multiple types of authentication; used in the order specified. For example, **radius none** specifies that RADIUS authentication is initially used; however, if RADIUS servers are not available, users are granted access without authentication.
- Example

  host1(config)#**aaa authentication ip default radius**

- Use the **no** version to set the authentication protocol to the default, **radius**.

aaa duplicate-address-check

- Use to enable or disable routing table address lookup or duplicate address check.
- The router checks the routing table for returned addresses for PPP users. If the address existed, then the user was denied access.

- You can disable this routing table address lookup or duplicate address check with the **aaa duplicate-address-check** command.
- Example

  host1(config)#**aaa duplicate-address-check enable**

- There is no **no** version.

aaa user accounting interval

- Use to specify the default interval between user accounting updates. The router uses the default interval when no value is specified in the RADIUS Acct-Interim-Interval attribute (RADIUS attribute 85).
- This command and the **aaa service accounting interval** command replace the **aaa accounting interva**l command, which is deprecated and might be removed in a future release. For information about setting the default interim accounting interval for services, see *Chapter 27, Configuring Service Manager*.
- The default interval is applied on a virtual router basis—this setting is used for all users who attach to the corresponding virtual router.
- Specify the user accounting interval in the range 10–1440 minutes. The default setting is 0, which disables the feature.
- Example

  host1(config)#**aaa user accounting interval 20**

- Use the **no** version to reset the accounting interval to 0, which turns off interim user accounting when no value is specified in the RADIUS Acct-Interim-Interval attribute.

aaa virtual-router

- Use to add virtual routers to a virtual router group. During AAA broadcast accounting, accounting records are sent to the accounting servers on the virtual routers in the named virtual router group.
- You can add up to four virtual routers to a virtual router group. Use the *indexInteger* parameter to specify the order (1–4) in which the virtual routers receive the accounting information. The *indexInteger* is used with the **no** version to delete a specific virtual router from a group (see Example 2).
- A virtual router name consists of 1–32 alphanumeric characters.
- The virtual router names in the group must be unique. An error message appears if you enter a duplicate name.
- Example 1

  host1(config)#**aaa accounting vr-group westVrGroup38**
  host1(config-vr-group)#**aaa virtual-router 1 vrWestA**
  host1(config-vr-group)#**aaa virtual-router 2 vrWestB**
  host1(config-vr-group)#**aaa virtual-router 4 vrSouth1**

- Example 2

  host1(config-vr-group)#**no aaa virtual-router 2**

- Use the **no** version of the command with the *indexInteger* parameter to delete a specific virtual router from a group. If all virtual routers in a group are deleted, the group is also deleted; a group must contain at least one virtual router.

deadtime

- Use to configure the amount of time (0–30 minutes) that a server is marked as unavailable if a request times out for the configured retry count.
- If a server fails to answer a request, the router marks it *unavailable*. The router does not send requests to the server until the router receives a response from the server or until the configured time is reached, whichever occurs first.
- If all servers fail to answer a request, then instead of marking all servers as unavailable, all servers are marked as available.
- To turn off the deadtime mechanism, specify a value of 0.
- Example

  host1(config)#**radius authentication server 10.10.0.1**
  host1(config-radius)#**deadtime 10**

- Use the **no** version to set the time to the default value, 0

key

- Use to configure secrets on the primary, secondary, and tertiary authentication servers.
- The authentication or accounting server secret is a text string used by RADIUS to encrypt the client and server *authenticator* field during exchanges between the router and a RADIUS authentication server. The router encrypts PPP PAP passwords using this text string.
- The default is no server secret.
- Example

  host1(config)#**radius authentication server 10.10.8.1**
  host1(config-radius)#**key gismo**

- Use the **no** version to remove the secret.

NOTE: Authentication fails if no key is specified for the authentication server.

logout subscribers

- Use to issue an administrative reset to the user's connection to disconnect the user.
- From Privileged Exec mode, you can log out **all** subscribers, or log out subscribers by **username**, **domain**, **virtual-router**, or **port**.
- This command applies to PPP users, as well as to non-PPP DHCP users.

- Example

  host1#**logout subscribers username bmurphy**

- There is no **no** version.

max-sessions

- Use to configure the number of outstanding requests supported by an authentication or accounting server.
- If the request limit is reached, the router sends the request to the next server.

NOTE: For information about the number of concurrent RADIUS requests that the router supports for authentication and accounting servers, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

- The same IP address can be used for both an authentication and accounting server (but not for multiple servers of the same type). The router uses different UDP ports for authentication servers and accounting servers.
- For each multiple of 255 requests (the RADIUS protocol limit), the router opens a new UDP source (or local) port on the server to send and receive RADIUS requests and responses.
- Example

  host1(config)#**radius authentication server 10.10.0.1**
  host1(config-radius)#**max-sessions 100**

- Use the **no** version to restore the default value, 255.

no radius client

- Use to remove all RADIUS servers for the virtual router context and to delete the E-series RADIUS client for the virtual router context.
- Example

  host1:boston(config)#**no radius client**

- There is no affirmative version of this command; there is only a **no** version.

radius algorithm

- Use to specify the algorithm—either **direct** or **round-robin**—that the E-series RADIUS client uses to contact the RADIUS server.
- Example

  host1(config)#**radius algorithm round-robin**

- Use the **no** version to set the algorithm to the default, **direct**.

radius override nas-info

- Use to configure the RADIUS client to include the NAS-IP-Address [4] and NAS-Identifier [32] RADIUS attributes of the authenticating virtual router in accounting packets when the client performs AAA broadcast accounting. Normally, the accounting packets include the NAS-IP-Address and NAS-Identifier of the virtual router that generated the accounting information.
- This override operation is a per-virtual router specification; use this command in the correct virtual router context.
- This command is ignored if the authenticating virtual router does not have a configured RADIUS server.
- Example

  host1(config)#**virtual-router vrXyz1**
  host1:vrXyz1(config)#**radius override nas-info**
  host1:vrXyz1(config)#**exit**

- Use the **no** version to restore inclusion of the NAS-IP-Address [4] and NAS-Identifier [32] RADIUS attributes of the virtual router that requested the accounting information.

radius rollover-on-reject

- Use to specify whether the router rolls over to the next RADIUS server when the router receives an Access-Reject message for the user it is authenticating.
- Example

  host1(config)#**radius rollover-on-reject enable**

- Use the **no** version to set the default of disable.

radius accounting server
radius authentication server

- Use to specify the IP address of **authentication** and **accounting** servers.
- Example

  host1(config)#**radius authentication server 10.10.10.1**
  host1(config-radius)**exit**
  host1(config)#**radius authentication server 10.10.10.2**
  host1(config-radius)**exit**
  host1(config)#**radius authentication server 10.10.10.3**
  host1(config-radius)**exit**
  host1(config)#**radius accounting server 10.10.10.20**
  host1(config-radius)**exit**
  host1(config)#**radius accounting server 10.10.10.30**

- Use the **no** version to delete the instance of the RADIUS server.

radius tunnel-accounting

- Use to specify that tunnel accounting be enabled or disabled.
- This command turns on accounting messages: Tunnel-Start, Tunnel-Stop, Tunnel-Reject, Tunnel-Link-Start, Tunnel-Link-Stop, and Tunnel-Link-Reject, as described in RFC 2867.

- Your router supports tunnel accounting for the L2TP LAC and LNS.
- Example

  host1(config)#**radius tunnel-accounting enable**

- Use the **no** version to set the default, disabled.

radius udp-checksum

- Use to disable UDP checksums on virtual routers you configure for B-RAS.
- Issue this command in the context of the appropriate virtual router.
- Example

  host1(config)#**virtual router boston**
  host1:boston(config)#**radius udp-checksum disable**

- Use the **no** version to reenable UDP checksums on virtual routers you configure for B-RAS.

radius update-source-addr

- Use to specify an alternate source IP address for the router to use rather than the default router ID.
- Example

  host1(config)#**radius update-source-addr 192.168.40.23**

- Use the **no** version to delete the parameter so that the router uses the router ID.

retransmit

- Use to set the maximum number of times that the router retransmits a RADIUS packet to an authentication or accounting server.
- If there is no response from the primary RADIUS authentication or accounting server in the specified number of retries, the client sends the request to the secondary server. If there is no response from the secondary server, the router sends the request to the tertiary server, and so on.
- Example

  host1(config)#**radius authentication server 10.10.8.1**
  host1(config-radius)#**retransmit 2**

- Use the **no** version to set the value to the default, 3 retransmits.

test aaa

- Use to verify RADIUS authentication and accounting and IP address assignment setup.
- You must specify either a PPP or Multilink PPP (MLPPP) user. PPP indicates a regular PPP user. MLPPP simulates Multilink PPP so that if multiple test commands are issued, all test users are bound by the same address.
- The command uses a username and password and attempts to authenticate a user, get an address assignment, and issue a start accounting request.

- Optionally, you can specify the virtual router context in which to authenticate the user.
- The command pauses for several seconds, then terminates the session by issuing a stop accounting request and an address release.
- Example

  host1#**test aaa ppp jsmith mypassword virtual-router charlie2**

NOTE: Specifying the password to associate with the username is optional. Specifying a virtual router is optional.

- There is no **no** version.

timeout

- Use to set the number of seconds before the router retransmits a RADIUS packet to an authentication or accounting server.
- If the interval is reached and there is no response from the primary RADIUS authentication or accounting server, the router attempts another retry. When the retry limit is reached, the client sends the request to the secondary server. When the retry limit for the secondary server is reached, the router attempts to reach the tertiary server, and so on.

NOTE: After the fourth retransmission, the configured timeout value is ignored, and the router uses a backoff algorithm that increases the timeout between each succeeding transmission.

The backoff algorithm is:

$$\text{timeout} = 2^{\text{retry-count}} + (\text{random}() \text{ modulo } 2^{\text{retry-count}})$$

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- Example

  host1(config)#**radius authentication server 10.10.0.1**
  host1(config-radius)#**timeout 5**

- Use the **no** version to restore the default value, 3 seconds.

NOTE: When a RADIUS server times out or when it has no available RADIUS identifier values, the router removes the RADIUS server from the list of available servers for a period of time. The router restores all configured servers to the list if it is about to remove the last server. Restoring the servers avoids having an empty server list.

udp-port

- Use to configure the UDP port on the router where the RADIUS authentication, accounting, preauthentication, and route-download servers reside. The router uses this port to communicate with the RADIUS authentication servers.
- Specify a port number in the range 0–65536. For authentication, preauthentication, or route-download servers, the default UDP port is 1812. For accounting servers, the default is 1813.
- For an accounting server, specify a port number in the range 0–65536. The default is 1813.
- Example

  host1(config)#**radius authentication server 10.10.9.1**
  host1(config-radius)#**udp-port 1645**

- Use the **no** version to set the port number to the default value.

SNMP Traps and System Log Messages

The router can send Simple Network Management Protocol (SNMP) traps to alert network managers when:

- A RADIUS server fails to respond to a request.
- A RADIUS server that previously failed to respond to a request (and was consequently removed from the list of active servers) returns to active service.

  Returning to active service means that the E-series RADIUS client receives a valid response to an outstanding RADIUS request after the server is marked unavailable.

- All RADIUS servers within a VR context fail to respond to a request.

The router also generates system log messages when RADIUS servers fail to respond or when they return to active service; no configuration is required for system log messages.

SNMP Traps

The router generates SNMP traps and system log messages as follows:

- If the first RADIUS server fails to respond to the RADIUS request, the E-series RADIUS client issues a system log message and, if configured, an SNMP trap indicating that the RADIUS server timed out. The E-series RADIUS client will not issue another system log message or SNMP trap regarding this RADIUS server until the deadtime expires, if configured, or for 3 minutes if deadtime is not configured.

- The E-series RADIUS client then sends the RADIUS request to the second configured RADIUS server. If the second RADIUS server fails to respond to the RADIUS request, the E-series RADIUS client again issues a system log message and, if configured, an SNMP trap indicating that the RADIUS server timed out.

- This process continues until either the E-series RADIUS client receives a valid response from a RADIUS server or the list of configured RADIUS servers is exhausted. If the list of RADIUS servers is exhausted, the E-series RADIUS client issues a system log message and, if configured, an SNMP trap indicating that all RADIUS servers have timed out.

If the E-series RADIUS client receives a RADIUS response from a "dead" RADIUS server during the deadtime period, the RADIUS server is restored to active status.

If the router receives a valid RADIUS response to an outstanding RADIUS request, the E-series client issues a system log message and, if configured, an SNMP trap indicating that the RADIUS server is now available.

System Log Messages

You do not need to configure system log messages. The router automatically sends them when individual servers do not respond to RADIUS requests and when all servers on a VR fail to respond to requests. The following are the formats of the warning level system log messages:

RADIUS [authentication | accounting] server *serverAddress* unavailable in VR *virtualRouterName* [; trying *next*S*erverAddress*]

RADIUS no [authentication | accounting] servers responding in VR *virtualRouterName*

RADIUS [authentication | accounting] server *serverAddress* available in VR *virtualRouterName*

Configuring SNMP Traps

This section describes how to configure the router to send traps to SNMP when RADIUS servers fail to respond to messages, and how to configure SNMP to receive the traps.

To set up the router to send traps:

1. (Optional) Enable SNMP traps when a particular RADIUS authentication server fails to respond to Access-Request messages.

   host1(config)#**radius trap auth-server-not-responding enable**

2. (Optional) Enable SNMP traps when all of the configured RADIUS authentication servers on a VR fail to respond to Access-Request messages.

   host1(config)#**radius trap no-auth-server-responding enable**

3. (Optional) Enable SNMP traps when a RADIUS authentication server returns to active service.

   host1(config)#**radius trap auth-server-responding enable**

4. (Optional) Enable SNMP traps when a RADIUS accounting server fails to respond to a RADIUS accounting request.

   host1(config)#**radius trap acct-server-not-responding enable**

5. (Optional) Enable SNMP traps when all of the RADIUS accounting servers on a VR fail to respond to a RADIUS accounting request.

   host1(config)#**radius trap no-acct-server-responding enable**

6. (Optional) Enable SNMP traps when a RADIUS accounting server returns to active service.

   host1(config)#**radius trap acct-server-responding enable**

To set up SNMP to receive RADIUS traps:

1. Set up the appropriate SNMP community strings.

   host1(config)#**snmp-server community admin view everything rw**
   host1(config)#**snmp-server community private view user rw**
   host1(config)#**snmp-server community public view everything ro**

2. Specify the interface whose IP address is the source address for SNMP traps.

   host1(config)#**snmp-server trap-source fastEthernet 0/0**

3. Configure the host that should receive the SNMP traps.

   host1(config)#**snmp-server host 10.10.132.93 version 2c 3 udp-port 162 radius**

4. Enable the SNMP router agent to receive and forward RADIUS traps.

   host1(config)#**snmp-server enable traps radius**

5. Enable the SNMP on the router.

   host1(config)#**snmp-server**

NOTE: For more information about these SNMP commands, see *Configuring Traps* in *JUNOSe System Basics Configuration Guide, Chapter 4, Configuring SNMP*.

radius trap acct-server-not-responding

- Use to enable or disable SNMP traps when a particular RADIUS accounting server fails to respond to a RADIUS accounting request.
- The associated SNMP object is rsRadiusClientTrapOnAcctServerUnavailable.

- Example

  host1(config)#**radius trap acct-server-not-responding enable**

- Use the **no** version to return to the default setting, disable.

radius trap acct-server-responding

- Use to enable or disable SNMP traps when a RADIUS accounting server returns to service after being marked as unavailable.
- The associated SNMP object is rsRadiusClientTrapOnAcctServerAvailable.
- This command affects only the current VR context.
- Example

  host1(config)#**radius trap acct-server-responding enable**

- Use the **no** version to restore the default, disable.

radius trap auth-server-not-responding

- Use to enable or disable SNMP traps when a RADIUS authentication server fails to respond to a RADIUS Access-Request message.
- The associated SNMP object is rsRadiusClientTrapOnAuthServerUnavailable.
- Example

  host1(config)#**radius trap auth-server-not-responding enable**

- Use the **no** version to return to the default setting, disabled.

radius trap auth-server-responding

- Use to enable RADIUS to send SNMP traps when a RADIUS authentication server returns to service after being marked as unavailable.
- The associated SNMP object is rsRadiusClientTrapOnAuthServerAvailable.
- This command affects only the current VR context.
- Example

  host1(config)#**radius trap auth-server-responding enable**

- Use the **no** version to restore the default setting, disabled.

radius trap no-acct-server-responding

- Use to enable or disable SNMP traps when all of the configured RADIUS accounting servers per VR fail to respond to a RADIUS accounting request.
- The associated SNMP object is rsRadiusClientTrapOnNoAcctServerAvailable.
- Example

  host1(config)#**radius trap no-acct-server-responding enable**

- Use the **no** version to return to the default setting, disabled.

radius trap no-auth-server-responding

- Use to enable or disable SNMP traps when all of the configured RADIUS authentication servers per VR fail to respond to a RADIUS Access-Request message.
- The associated SNMP object is rsRadiusClientTrapOnNoAuthServerAvailable.
- Example

  host1(config)#**radius trap no-auth-server-responding enable**

- Use the **no** version to return to the default setting, disabled.

Configuring Local Authentication Servers

The AAA local authentication server enables the E-series router to provide local PAP and CHAP user authentication for subscribers. The router also provides limited authorization, using the IP address, IP address pool, and operational virtual router parameters. When a subscriber logs on to the E-series router that is using local authentication, the subscriber is authenticated against user entries in a local user database; the optional parameters are assigned to subscribers after the subscriber is authenticated.

Creating the Local Authentication Environment

To create your local authentication environment:

1. Create local user databases—Create the default database or a named database.
2. Add entries to local user databases—Add user entries to the database. A database can contain information for multiple users.
3. Assign a local user database to the virtual router—Specify the database that the virtual router will use to authenticate subscribers.
4. Enable local authentication on the virtual router—Specify the **local** method as an AAA authentication method used by the virtual router.

Creating Local User Databases

When a subscriber connects to an E-series router that is using local authentication, the local authentication server uses the entries in the local user database selected by the virtual router to authenticate the subscriber.

A local authentication server can have multiple local user databases, and each database can have entries for multiple subscribers. The default local user database, if it exists, is used for local authentication by default. The E-series router supports a maximum of 100 user entries. A maximum of 100 databases can be configured.

To create a local user database, use the **aaa local database** command and the name of the database; use the name **default** to create the default local user database:

host1(config)#**aaa local database westLocal40**

Adding User Entries to Local User Databases

The local authentication server uses the information in a local user database to authenticate a subscriber. A local user database can contain information for multiple users.

The E-series router provides two commands for adding entries to local user databases: the **username** command and the **aaa local username** command. You can specify the following parameters:

- Username—Name associated with the subscriber.
- Passwords and secrets—Single words that can be encrypted or unencrypted. Passwords use two-way encryption, and secrets use one-way encryption. Both passwords and secrets can be used with PAP authentication; however, only passwords can be used with CHAP authentication.
- IP address—The IP address to assign to the subscriber (**aaa local username** command only).
- IP address pool—The IP address pool used to assign the subscriber's IP address (**aaa local username** command only).
- Operational virtual router—The virtual router to which the subscriber is assigned. This parameter is applicable only if the subscriber is authenticated by the default virtual router (**aaa local username** command only).

Using the username Command

The **username** command is similar to the command used by some third-party vendors. The command can be used to add entries in the default local user database; it is not supported for named local user databases. The IP address, IP address pool, and operational virtual router parameters are not supported in the **username** command. However, after the user is added to the default local user database, you can use the **aaa local username** command with a database name **default** to enter Local User Configuration mode and add the additional parameters.

NOTE: If the default local user database does not exist, the **username** command creates this database and adds the user entry to the database.

To add a subscriber and password or secret to the default local user database, complete the following step:

```
host1(config)#username rockyB password rockyPassword
```

Using the aaa local username Command

To enter Local User Configuration mode and add user entries to a local user database, use the following commands:

1. Specify the subscriber's username and the database you want to use. Use the database name **default** to specify the default local user database. This command also puts the router into Local User Configuration mode.

   host1(config)# **aaa local username cksmith database westLocal40**
   host1(config-local-user)#

NOTE: You can use the **aaa local username** command to add or modify user entries to a default database that was created by the **username** command.

2. (Optional) Specify the type of encryption algorithm and the password or secret that the subscriber must use to connect to the router. A subscriber can be assigned either a password or a secret, but not both. For example:

   host1(config-local-user)#**password 8 iTtakes2%**

3. (Optional) Specify the IP address to assign to the subscriber.

   host1(config-local-user)#**ip-address 192.168.101.19**

4. (Optional) Specify the IP address pool used to assign the subscriber's IP address.

   host1(config-local-user)#**ip-address-pool svPool2**

5. (Optional) Assign the subscriber to an operational virtual router. This parameter is applicable only if the subscriber is authenticated in the default virtual router.

   host1(config-local-user)#**operational-virtual-router boston2**

Assigning a Local User Database to a Virtual Router

Use the procedure in this section to assign a local user database to a virtual router. The virtual router uses the database for local authentication when the subscriber connects to the E-series router. Use the following commands in Global Configuration mode:

NOTE: If you do not specify a local user database, the virtual router selects the default database by default. This applies to all virtual routers.

1. Specify the virtual router name.

   host1(config)# **virtual-router cleveland**

2. Specify the database to use for authentication on this virtual router.

   host1:cleveland(config)# **aaa local select database westLocal40**

Enabling Local Authentication on the Virtual Router

On the E-series router, RADIUS is the default AAA authentication method for PPP subscribers. Use the commands in this section to specify that the local authentication method is used.

To enable local authentication on the default router, use the following command:

```
host1(config)# aaa authentication ppp default local
```

To enable local authentication on a specific virtual router, first select the virtual router:

```
host1(config)# virtual-router cleveland
host1:cleveland(config)# aaa authentication ppp default local
```

Configuration Commands

Use the following commands to configure the local authentication server.

aaa authentication default

- Use to specify that the local authentication method is used to authenticate PPP subscribers on the default virtual router or on the selected virtual router.

NOTE: You can specify multiple authentication methods; for example, **aaa authentication ppp default local radius**. If, during local authentication, the matching user entry is not found in a populated database or if it is found and rejected, the authentication procedure terminates. However, if the specified local user database is empty or if it does not exist, the authentication process uses the next authentication method specified (RADIUS in this case).

- Example

  ```
  host1(config)#aaa authentication ppp default local radius
  ```

- Use the **no** version to restore the default authentication method of **radius**.

aaa local database

- Use to create a local user database.
- Use the database name **default** to specify the default local user database, or enter a name for the specific local user database.
- Example

  ```
  host1(config)#aaa local database westLocal40
  ```

- Use the **no** version to delete the specified database and all entries in the database.

aaa local select database

- Use to assign the local user database that the virtual router uses for local authentication.
- Example

  host1(config)#**virtual-router cleveland**
  host1:cleveland(config)#**aaa local select database westLocal40**

- Use the **no** version to restore the default setting, which uses the default local user database for local authentication.

aaa local username

- Use to configure a user entry in the specified local user database and to enter Local User Configuration mode.
- The username must be unique within a particular database; however, the same username can be used in different databases.
- Use the database name **default** to configure the username in the default local user database.

NOTE: The router supports usernames up to 64 characters long; however, PAP and CHAP support is limited to 31-character usernames.

- Example

  host1(config)#**aaa local username cksmith database westLocal40**

- Use the **no** version to delete the user entry from the specified local user database. Use the database name **default** to delete the user entry from the default local user database.

ip-address

- Use to specify the IP address parameter for a user entry in the local user database. The address is negotiated with the subscriber after the subscriber is authenticated.
- Example

  host1(config-local-user)#**ip-address 192.168.42.6**

- Use the **no** version to delete the IP address parameter from the user entry in the local user database.

ip-address-pool

- Use to specify the IP address pool parameter for a user entry in the local user database. The address pool is used to assign an IP address to the subscriber; the address is negotiated with the subscriber after the subscriber is authenticated.
- Example

  host1(config-local-user)#**ip-address-pool svPool2**

- Use the **no** version to delete the IP address pool parameter from the user entry in the local user database.

operational-virtual-router

- Use to specify the virtual router parameter for a user entry in the local user database. The subscriber is assigned to the operational virtual router only if the default virtual router performs the authentication.
- If authentication is performed by a non-default virtual router, then the subscriber is assigned to the same virtual router that performs authentication, regardless of this parameter setting.
- Example

  host1(config-local-user)#**operational-virtual-router boston2**

- Use the **no** version to delete the operational virtual router parameter from the user entry in the local user database.

password

- Use to add a password to a user entry in the local user database. The password is used to authenticate a subscriber, and is encrypted by means of a two-way encryption algorithm.

NOTE: CHAP authentication requires that passwords and secrets be stored in clear text or use two-way encryption. Two-way encryption is not supported for the **secret** command. Therefore, use the **password** command if you want to enable encryption for subscribers that use CHAP authentication.

- The new password replaces any current password or secret.
- Specify one of the following encryption algorithms, followed by the password:
  - 0—An unencrypted password; this is the default
  - 8—A two-way encrypted password
- Example

  host1(config-local-user)#**password 0 myPassword**

- Use the **no** version to delete the password or secret from the user entry in the local user database.

secret

- Use to add a secret to a user entry in the local user database. The secret is used to authenticate a subscriber, and is encrypted by means of the Message Digest 5 (MD5) encryption algorithm.

NOTE: CHAP authentication requires that passwords and secrets be stored in clear text or use two-way encryption. Two-way encryption is not supported for the **secret** command. Therefore, use the **password** command if you want to enable encryption for subscribers that use CHAP authentication.

- The new secret replaces any current password or secret.
- Specify one of the following encryption algorithms, followed by the secret:
  - 0—An unencrypted secret; this is the default
  - 5—An MD5-encrypted secret
- Example

  host1(config-local-user)#**secret 5 Q3&t9REwk45jxSM#fj$z**

- Use the **no** version to delete the secret or password from the user entry in the local user database.

username

- Use to configure a user entry and optional password or secret in the default local user database. This command creates the database if it does not already exist.
- Optionally, specify a password or secret that is assigned to the user in the default local user database, or specify that no password is required for the particular username.
  - Specify one of the following encryption algorithms, followed by the password:
    - 0—An unencrypted password; this is the default
    - 8—A two-way encrypted password
  - Specify one of the following encryption algorithms, followed by the secret:
    - 0—An unencrypted secret; this is the default
    - 5—An MD5-encrypted secret
  - Use the **nopassword** keyword to remove the password or secret

NOTE: CHAP authentication requires that passwords and secrets be stored in clear text or use two-way encryption. Two-way encryption is not supported for the **secret** command. Therefore, use the **password** command if you want to enable encryption for subscribers that use CHAP authentication.

- Example

  host1(config-local-user)#**username cksmith secret 5 Q3&t9REwk45jxSM#fj$z**

- Use the **no** version to delete the username entry from the default local user database.

Local Authentication Example

This example creates a sample local authentication environment. The steps in this example:

1. Create a named local user database (**westfordLocal40**).
2. Configure the database **westfordLocal40**.
   - Add users **btjones** and **maryrdavis** and their attributes to the database.
3. Create the default local database using the optional **username** command.
   - Add optional subscriber parameters for user **cksmith** to the default database.
4. Assign the default local user database to virtual router **cleveland**; assign database **westfordLocal40** to the default virtual router and to virtual router **chicago**.
5. Enable AAA authentication methods **local** and **none** on all virtual routers.
6. Use the **show** commands to display information for the local authentication environment (various **show** command displays are listed after the example).

Example 1 This example shows the commands you use to create the AAA local authentication environment.

```
host1(config)#aaa local database westfordLocal40
host1(config)#aaa local username btjones database westfordLocal40
host1(config-local-user)#secret 38schillCy
host1(config-local-user)#ip-address-pool addressPoolA
host1(config-local-user)#operational-virtual-router boston2
host1(config-local-user)#exit
host1(config)#aaa local username maryrdavis database westfordLocal40
host1(config-local-user)#secret 0 dav1sSecret99
host1(config-local-user)#ip-address 192.168.20.106
host1(config-local-user)#operational-virtual-router boston1
host1(config-local-user)#exit
host1(config)#username cksmith password 0 yourPassword1
host1(config)#aaa local username cksmith database default
host1(config-local-user)#ip-address-pool addressPoolA
host1(config-local-user)#operational-virtual-router boston2
host1(config-local-user)#exit
host1(config)#virtual-router cleveland
host1(config)#aaa local select database default
host1(config)#virtual-router default
host1(config)#aaa local select database westfordLocal40
host1(config)#virtual-router chicago
host1(config)#aaa local select database westfordLocal40
host1(config)#virtual-router default
host1(config)#aaa authentication ppp default local none
```

Example 2 This example verifies that local authentication is configured on the router.

```
host1#show aaa authentication ppp default
local none
```

Example 3 This example uses the **show configuration category aaa local-authentication** command with the **databases** keyword to show the local user databases that are configured on the router.

```
host1#show configuration category aaa local-authentication databases
! Configuration script being generated on TUE NOV 09 2004 12:50:18 UTC
! Juniper Edge Routing Switch ERX-1400
! Version: 6.1.0 (November 8, 2004  18:31)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system configuration.
! The category displayed is: aaa local-authentication databases
!
hostname host1
aaa new-model
aaa local database default
aaa local database westfordLocal40
```

Example 4 This example uses the **local-authentication users** keywords to show the configured users and their parameters. The password for **username cksmith** is displayed unencrypted because the default setting of disabled or no for the **service password-encryption** command is used for the example. Secrets are always displayed encrypted.

```
host1#show configuration category aaa local-authentication users
! Configuration script being generated on THU NOV 11 2004 13:40:41 UTC
! Juniper Edge Routing Switch ERX-1400
! Version: 6.1.0 (November 10, 2004  21:15)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system configuration.
! The category displayed is: aaa local-authentication users
!
hostname host1
aaa new-model
aaa local username cksmith database default
 password yourPassword1
 operational-virtual-router boston2
 ip-address-pool addressPoolA
!
aaa local username btjones database westfordLocal40
 secret 5 }9s7-4N<WK2)2=)^!6~#
 operational-virtual-router boston2
 ip-address-pool addressPoolA
!
aaa local username maryrdavis database westfordLocal40
 secret 5 E@A:nDXJJ<irb\`mF#[j
 operational-virtual-router boston1
 ip-address 192.168.20.106
```

Example 5 This example uses the **users include-defaults** keywords to show the configured users and their parameters, including the default parameters **no-ip-address** and **no ip-address-pool**.

```
host1#show configuration category aaa local-authentication users include-defaults
! Configuration script being generated on TUE NOV 09 2004 13:09:03 UTC
! Juniper Edge Routing Switch ERX-1400
! Version: 6.1.0 (November 8, 2004  18:31)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system configuration.
! The category displayed is: aaa local-authentication users
!
hostname host1
aaa new-model
aaa local username cksmith database default
 password yourPassword1
 operational-virtual-router boston2
 no ip-address
 ip-address-pool addressPoolA
!
aaa local username btjones database westfordLocal40
 secret 5 }9s7-4N<WK2)2=)^!6~#
 operational-virtual-router boston2
 no ip-address
 ip-address-pool addressPoolA
!
aaa local username maryrdavis database westfordLocal40
 secret 5 E@A:nDXJJ<irb\`mF#[j
 operational-virtual-router boston1
 ip-address 192.168.20.106
 no ip-address-pool
```

Example 6 This example uses the **virtual-router** keyword with the **default** specification to show the local user database that is used by the default virtual router.

```
host1#show configuration category aaa local-authentication virtual-router default
! Configuration script being generated on TUE NOV 09 2004 13:09:45 UTC
! Juniper Edge Routing Switch ERX-1400
! Version: 6.1.0 (November 8, 2004  18:31)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system configuration.
! The category displayed is: aaa local-authentication
!
virtual-router default
aaa local select database westfordLocal40
```

Example 7 This example uses the **virtual-router** keyword with a named virtual router. The **include-defaults** keyword shows the default configuration, including the line showing that there is no named local user database selected.

```
host1#show configuration category aaa local-authentication virtual-router cleveland include-defaults
! Configuration script being generated on TUE NOV 09 2004 13:09:25 UTC
! Juniper Edge Routing Switch ERX-1400
! Version: 6.1.0 (November 8, 2004  18:31)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system configuration.
! The category displayed is: aaa local-authentication
!
virtual-router cleveland
no aaa local select
```

Configuring Tunnel Subscriber Authentication

When a AAA domain map includes any tunnel configuration, users in this domain are considered to be tunnel subscribers. By default, any such subscriber is granted access without being authenticated by the authentication server. Access is granted even when the user provides an invalid username and password. The tunnel configuration for the subscriber comes from the AAA domain map.

For example, if the authentication protocol for a AAA domain map is RADIUS, AAA grants access to subscribers from this domain immediately without sending access requests to the configured RADIUS server. Because of this behavior, these subscribers cannot get any additional control attributes from the authentication server. This reduces your ability to manage the tunnel subscribers.

In this default situation, if you want the domain subscribers to be managed by the authentication server for any control attribute, then that domain map cannot have any tunnel configuration. Typically, this means you must configure the subscriber individually.

You can use the **tunnel-subscriber authentication** command to get around this limitation. When you enable authentication with this command, access requests for the tunnel subscribers in the domain are sent to the configured authentication server. When the access replies from authentication server are processed, various user attributes from the server can be applied to the subscribers.

When the authentication server returns tunnel attributes, these returned values take precedence over the corresponding local tunnel configuration values in the AAA domain map. If the server does not return any tunnel attributes, then the tunnel subscriber's tunnel settings are configured according to the domain map's tunnel settings.

If the authentication server returns a redirect VSA and the corresponding AAA domain map has local tunnel configurations, the VSA is ignored. Access is denied to the user when the authentication server rejects the access request.

The **tunnel-subscriber authentication** command has no effect on subscribers in a domain with no tunnel configuration. When a AAA domain map has no tunnel configuration, subscribers in the domain are authenticated by the authentication server. If the server grants access, then the subscribers get their tunnel settings only from the authentication server.

By default, tunnel subscribers in the domain are granted access with no external authentication. Use the **enable** keyword to enable authentication. Use the **disable** keyword to restore disable user authentication.

To configure authentication of tunnel subscribers within a AAA domain by an external authentication server.

- Example

  host1(config-domain-map)#**tunnel-subscriber authentication enable**

Related Topics

- **tunnel-subscriber authentication** command
- Mapping a User Domain Name to a Virtual Router on page 9

Configuring Name Server Addresses

You can assign IP or IPv6 addresses for DNS and IP addresses for WINS name servers. During setup negotiations between the router and remote PC clients using PPP (Internet Protocol Control Protocol [IPCP] specifically), the remote client may request the DNS and WINS server IP addresses. If the IP addresses passed to the router by the remote PC client are different from the ones configured on your router, the router returns the values that you configured as the correct values to the remote PC client. This behavior is controlled by the **ppp peer dns** and **ppp peer wins** interface commands.

If a PPP client request contains address values of 0.0.0.0 for the name servers, the router considers that the remote PC client is not configured and returns the configured values as the correct values to the remote PC client.

The DNS and WINS addresses are considered as part of the PPP user information. These addresses are provided to the PPP client as part of the IPCP negotiations between PPP peers. For details, see RFC 1877—PPP Internet Protocol Control Protocol Extensions for Name Server Addresses (December 1995).

NOTE: All name server address parameters are defined in the context of a virtual router.

Configuration Tasks

This section contains procedures for configuring the DNS and WINS primary and secondary name server addresses.

DNS Primary and Secondary NMS Configuration

To configure the DNS primary and secondary name server addresses:

1. Specify the IP address of the DNS primary name server.

   host1(config)#**aaa dns primary 10.10.10.5**

   or, for IPv6,

   host1(config)#**aaa ipv6-dns primary 2001:db8::8001**

2. Specify the IP address of the DNS secondary name server.

   host1(config)#**aaa dns secondary 10.10.10.6**

   or, for IPv6,

   host1(config)#**aaa ipv6-dns secondary 2001:db8::8002**

NOTE: The router uses name server addresses exclusively for PPP clients and not for domain name server resolution.

aaa dns primary

- Use to specify the IP address of the DNS primary name server.
- Example

  host1(config)#**aaa dns primary 10.10.10.5**

- Use the **no** version to set the corresponding address to 0.0.0.0.

aaa dns secondary

- Use to specify the IP address of the DNS secondary name server.
- Example

  host1(config)#**aaa dns secondary 10.10.10.6**

- Use the **no** version to set the corresponding address to 0.0.0.0.

aaa ipv6-dns primary

- Use to specify the IPv6 address of the DNS primary name server.
- Example

  host1(config)#**aaa ipv6-dns primary 2001:db8::8001**

- Use the **no** version to set the corresponding address to 0 (or ::).

aaa ipv6-dns secondary

- Use to specify the IPv6 address of the DNS secondary name server.
- Example

  host1(config)#**aaa ipv6-dns secondary 2001:db8::8002**

- Use the **no** version to set the corresponding address to 0 (or ::).

WINS Primary and Secondary NMS Configuration

To configure the WINS primary and secondary name server addresses:

1. Specify the IP address of the WINS primary name server.

   host1(config)#**aaa wins primary 192.168.10.05**

2. Specify the IP address of the WINS secondary name server.

   host1(config)#**aaa wins secondary 192.168.10.40**

NOTE: The router uses name server addresses exclusively for PPP clients and not for domain name server resolution.

aaa wins primary

- Use to specify the IP address of the WINS primary name server.
- Example

  host1(config)#**aaa wins primary 192.168.10.05**

- Use the **no** version to set the corresponding address to 0.0.0.0.

aaa wins secondary

- Use to specify the IP address of the WINS secondary name server.
- Example

  host1(config)#**aaa wins secondary 192.168.10.40**

- Use the **no** version to set the corresponding address to 0.0.0.0.

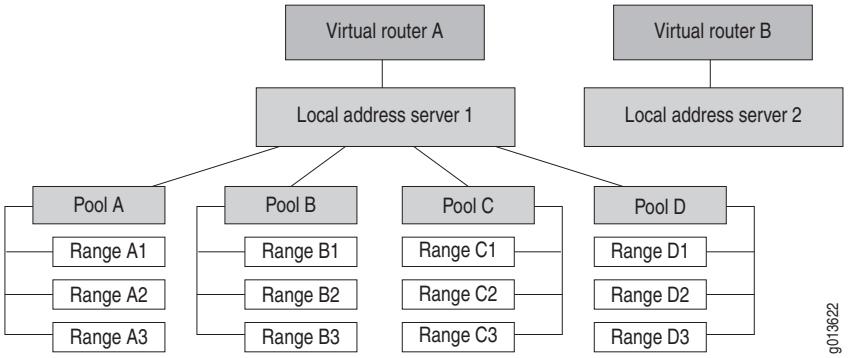
Configuring Local Address Servers

The local address server allocates IP addresses from a pool of addresses stored locally on the router. You can optionally configure shared local address pools to obtain addresses from a DHCP local address pool that is in the same virtual router. Addresses are provided automatically to client sessions requiring an IP address from a virtual router that is configured to use a local address pool.

A local address server is defined in the context of a virtual router. You create a local address server when you configure the first local pool. Local address servers exist as long as the virtual router exists or until you remove them by deleting all configured pools.

Figure 1 illustrates the local address pool hierarchy. Multiple local address server instances, one per virtual router. can exist. Each local address server can have one or more local address pools. Each pool can contain a number of IP addresses that are available for allocation and used by clients, such as PPP sessions.

Figure 1: Local Address Pool Hierarchy



Local Address Pool Ranges

As shown in Figure 1, each local address pool is named and contains ranges of sequentially ordered IP addresses. These addresses are allocated when the AAA server makes a request for an IP address.

If a local address pool range is exhausted, the next range of addresses is used. If all pool ranges are exhausted, you can configure a new range to extend or supplement the existing range of addresses, or you can create a new pool. The newly created pool range is then used for future address allocation. If addresses allocated from the first pool range are released, then subsequent requests for addresses are taken from the first pool range.

Addresses are assigned sequentially from a range within a pool. If a range has no addresses available, the next range within that pool is used. If a pool has no addresses available, the next configured pool is used, unless a specific pool is indicated.

Local Address Pool Aliases

An alias is an alternate name for an existing local address pool. It comprises an alias name and a pool name.

When the AAA server requests an IP address from a specific local address pool, the local address server first verifies whether an alias exists for the requested pool. If an alias exists, the IP address is allocated from the pool specified by the alias. If no alias exists, the IP address is allocated from the pool originally specified in the request.

The use of aliases simplifies management of subscribers. For example, you can use an alias to migrate subscribers from one local address pool to another. Instead of having to modify countless subscriber records on the AAA server, you create an alias to make the configuration change.

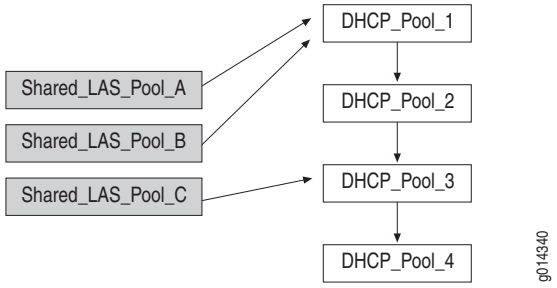
Shared Local Address Pools

Typically, the local address server allocates IP addresses from a pool of addresses that is stored locally on the router. However, *shared* local address pools enable a local address server to hand out addresses that are allocated from DHCP local server address pools within the same virtual router. The addresses are configured and managed within DHCP. Therefore, thresholds are not configured on the shared pool, but are instead managed by the referenced DHCP local server pool.

A shared local address pool references one DHCP address pool. The shared local address pool can then obtain addresses from the referenced DHCP address pool and from any DHCP address pools that are linked to the referenced DHCP address pool.

Figure 2 illustrates a shared local address pool environment that includes four linked DHCP address pools. In the figure, both Shared_LAS_Pool_A and Shared_LAS_Pool_B reference DHCP_Pool_1, and can therefore obtain addresses from all four DHCP address pools. Shared_LAS_Pool_C references DHCP_Pool_3 and can get addresses from DHCP_Pool_3 and DHCP_Pool_4.

Figure 2: Shared Local Address Pools



When the local address server requests an address from a shared address pool, the address is returned from the referenced DHCP pool or a subsequent linked pool. If no address is available, DHCP notifies the local address server and the search is ended.

Keep the following guidelines in mind when using shared local address pools:

- The DHCP attributes do not apply to shared local address pools; for example, the lease time for shared local address pools is infinite.
- When you delete the referenced DHCP address pool, DHCP notifies the local address server and logs out all subscribers that are using addresses from the deleted pool.
- When you delete a shared local address pool, the local address server logs out the subscribers that are using addresses from the deleted pool, then notifies DHCP and releases the addresses.
- If the chain of linked DHCP address pools is broken, no action is taken and the existing subscribers retain their address. However, the DHCP local address pools that are no longer part of the chain are now unable to provide any new addresses.

Example This following commands create the shared address pools in Figure 2 on page 54:

```
host1(config)#ip local shared-pool Shared_LAS_Pool_A DHCP_Pool_1
host1(config)#ip local shared-pool Shared_LAS_Pool_B DHCP_Pool_1
host1(config)#ip local shared-pool Shared_LAS_Pool_C DHCP_Pool_3
```

SNMP Thresholds

An address pool has SNMP thresholds associated with it that enable the local address server to signal SNMP traps when certain conditions exist. These thresholds include high utilization threshold and abated utilization threshold. If a pool's outstanding addresses exceed the high utilization threshold and the SNMP trap signaling is enabled, SNMP is notified. Likewise, when a pool's utilization drops below the abated threshold utilization threshold, SNMP is notified.

Configuring a Local Address Server

You can create, modify, and delete address pools. You can display address pool information or status with the **show ip local pool** command. The following are examples of tasks you can configure:

- Specify an addressing scheme.

  host1(config)#**ip address-pool local**

- Map an address pool name to a range of local addresses. You can also use this command to add additional ranges to a pool.

  host1(config)#**ip local pool addrpool_10 192.168.56.10 192.168.56.15**

- Map an address pool name to a domain name.

  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#**address-pool-name poolA**

- Delete an address pool.

  host1(config)#**no ip local pool addrpool_10**

NOTE: If a pool or range is deleted and addresses are outstanding, the AAA server logs out the clients using the addresses.

- Create a shared local address pool.

  host1(config)#**ip local shared-pool Shared_LAS_Pool_A DHCP_Pool_1**

- Delete a shared local address pool.

  host1(config)#**no ip local shared-pool Shared_LAS_Pool_C**

- Set SNMP variables by specifying an existing pool name and values.

  host1(config)#**ip local pool addrpool_10 warning 90 80**

address-pool-name

- Use to specify the name of the local address pool from which the router allocates addresses for the domain that you are configuring.
- If the authentication server does not return an address, the router allocates an address from this pool. The authentication server may override this pool name using RADIUS attributes such as Framed-Pool.
- Example

  host1(config)#**aaa domain-map westford.com**
  host1(config-domain-map)#**address-pool-name poolA**

- Use the **no** version to remove the address pool name.

ip address-pool

- Use to specify the addressing scheme: **dhcp**, **local**, or **none**.
- The addressing scheme **none** returns a special indicator to AAA that enables the remote PPP client to assign its own address.
- Example

  host1(config)#**ip address-pool dhcp**

- Use the **no** version to specify the default, local.

ip local alias

- Use to create an alias for an existing local address pool. The IP address is allocated from the pool specified by the alias rather than from the pool specified in the IP address request.
- An alias name may contain up to 16 characters.
- You can configure a maximum of 32 aliases per virtual router.
- A local address pool can have multiple aliases.
- You can set the name of the alias to match the name of a local address pool; however, the two names used in the alias cannot be the same.
- You can modify an existing alias with a different local address pool name.
- When a local address pool is deleted, all aliases with the matching pool name are also deleted.
- Example

  host1(config)#**ip local alias groupB pool-name addrpool_10**

- Use the **no** version to remove the alias name.

ip local pool

- Use to map an address pool name to a range of local addresses.
- You can create a pool with no address ranges configured for it.
- A name may contain up to 16 characters.
- Example

  host1(config)#**ip local pool addrpool_10 192.168.56.10 192.168.56.15**

- Use the **no** version to remove the local pool (all ranges), or the specified range.

ip local pool snmpTrap

- Use to enable SNMP pool utilization traps.
- Example

  host 1(config)#**ip local pool addr_test snmpTrap**

- Use the **no** version to disable SNMP pool utilization traps.

ip local pool warning

- Use to set SNMP utilization warning threshold values.
- Example

  host1(config)#**ip local pool addr_test warning 90 80**

- Use the **no** version to reset the attributes to their default values; high threshold 85, abated threshold 75.

ip local shared-pool

- Use to create a local shared address pool and to specify the DHCP address pool that provides the addresses.
- You can reference a DHCP address pool that has not yet been configured.
- Example

  host1(config)#**ip local shared-pool sharedPool11 dhcpPool6**

- Use the **no** version to delete a specific local shared address pool.

Configuring DHCP Features

DHCP provides a mechanism through which computers using Transmission Control Protocol/IP (TCP/IP) can obtain an IP address and protocol configuration parameters automatically from a DHCP server on the network.

The E-series router provides support for the following DHCP features:

- DHCP proxy client
- DHCP relay agent
- DHCP relay proxy

- DHCP local server
- DHCP external server

For more information about DHCP, see *Chapter 17, DHCP Overview*.

Creating an IP Interface

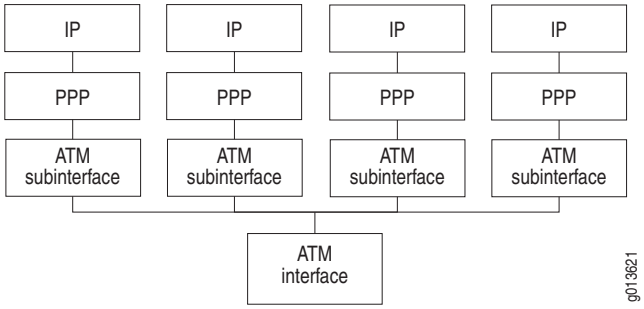
You can configure IP interfaces that support the following configurations:

- A single PPP client per ATM or Frame Relay subinterface
- Multiple PPP clients per ATM subinterface

Single Clients per ATM Subinterface

Figure 3 shows a conceptual view of the configuration of a single PPP client per ATM subinterface.

Figure 3: Single PPP Clients per ATM Subinterface



Configure an ATM interface by entering Configuration mode and performing the following tasks. For more information about configuring ATM interfaces, see *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM*.

1. Configure a physical interface.

   host1(config)#**interface atm 0/1**

2. Configure the subinterface.

   host1(config-if)#**interface atm 0/1.20**

3. Configure a permanent virtual circuit (PVC) by specifying the *vcd* (virtual circuit descriptor), the *vci* (virtual channel identifier), the *vpi* (virtual path identifier), and the encapsulation type.

   host1(config-if)#**atm pvc 10 22 100 aal5snap**

4. Configure PPP encapsulation.

   host1(config-if)#**encapsulation ppp**

5. Configure PAP or CHAP authentication.

   host1((config-if))#**ppp authentication chap**

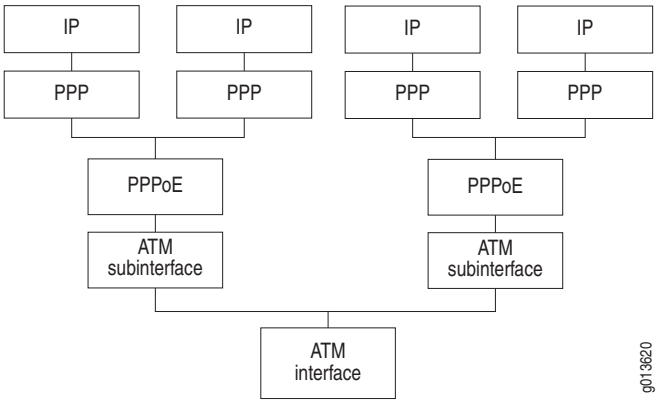
6. Assign a profile to the PPP interface.

   host1(config-subif)#**profile foo**

Multiple Clients per ATM Subinterface

Figure 4 shows how PPPoE supports multiplexing of multiple PPP sessions per ATM subinterface.

Figure 4: Multiple PPP Clients per ATM Subinterface



Configure an ATM interface by entering Configuration mode and performing the following tasks. For more information about configuring ATM interfaces, see *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM*.

1. Configure a physical interface.

   host1(config)#**interface atm 0/1**

2. Configure the subinterface.

   host1(config-if)#**interface atm 0/1.20**

3. Configure a PVC by specifying the *vcd* (virtual circuit descriptor), the *vci* (virtual channel identifier), the *vpi* (virtual path identifier), and the encapsulation type.

   host1(config-if)#**atm pvc 10 22 100 aal5snap**

4. Configure PPPoE encapsulation.

   host1(config-if)#**encapsulation pppoe**

5. Configure the subinterface for one PPP client.

   host1(config-if)#**interface atm 0/1.20.1**

6. Configure PPP encapsulation.

   host1(config-if)#**encapsulation ppp**

7. Configure PAP or CHAP authentication.

   host1((config-if))#**ppp authentication chap**

8. Apply the profile to the PPP interface.

   host1(config-subif)#**profile foo2**

9. Configure the subinterface for a second PPP client.

   host1(config-if)#**interface atm 0/1.20.2**

10. Configure PPP encapsulation.

    host1(config-if)#**encapsulation ppp**

11. Configure PAP or CHAP authentication.

    host1((config-if))#**ppp authentication chap**

12. Apply the profile to the PPP interface.

    host1(config-subif)#**profile foo2**

Configuring AAA Profiles

An AAA profile is a set of characteristics that act as a pattern that you can assign to domain names. Once you create an AAA profile, you can map it between a PPP client's domain name and certain AAA services on given interfaces. Using AAA profiles, you can:

- Allow or deny a domain name access to AAA authentication
- Map the original domain name to the mapped domain name for domain name lookup
- Use domain name aliases
- Force tunneling whenever a domain map contains tunnel attributes
- Manually set the NAS-Port-Type attribute (RADIUS attribute 61) for ATM and Ethernet interfaces
- Set the Service-Description attribute (RADIUS attribute 26-53)

An AAA profile contains a set of commands to control access for the incoming PPP subscriber. If no AAA profile is used, AAA continues as normal. The user's name and domain name are not changed as a result of an AAA profile mapping.

NOTE: There are two domain names with special meaning. The domain name **none** indicates that there is no domain name present in the subscriber's name. For more information about **none**, see the section *Mapping User Requests Without a Valid Domain Name* on page 9. The domain name **default** indicates that no other match occurs. For more information about **default**, see the section *Mapping User Requests Without a Configured Domain Name* on page 9.

Allowing or Denying Domain Names

You can control a PPP subscriber's access to certain domains on given interfaces. As the administrator, you can use the **deny** command to prevent PPP subscribers from using unauthorized domain names. Using the **allow** command, you can allow PPP subscribers to use authorized domain names.

Configuration Example

In this example, the administrator wants to restrict access of a PPP interface to the specific domain **abc.com**.

1. Create an AAA profile.

   host1(config)#**aaa profile restrictToABC**

2. Specify the domain name you want to allow.

   host1(config-aaa-profile)#**allow abc.com**

3. Specify the domain name you want to restrict.

   host1(config-aaa-profile)#**deny default**

4. Associate the AAA profile to the designated PPP interface.

   host1(config-if)#**ppp aaa-profile restrictToABC**

When configured as such, the following is a likely scenario:

- PPP passes the AAA profile **restrictToABC** to AAA in the authentication request.
- AAA performs the following:
  - Receives the authentication request from PPP with the subscriber's name **will@xyz.com**.
  - Parses the domain name **xyz.com** and examines the specified AAA profile **restrictToABC**.
  - Determines that the AAA profile **restrictToABC** is valid.

- Searches **restrictToABC** for a match on the PPP subscriber's domain name and finds no match.
- Searches **restrictToABC** for a match on the domain name **default**.
- Finds a match and denies the user access.

Using Domain Name Aliases

You can translate an original domain name to a new domain name via the **translate** command. The command allows you to create domain name aliases; that is, the grouping of multiple domain names into a single domain name. You can partition PPP subscribers with the same domain into separate domains, based on the PPP interface.

NOTE: Partitioning subscribers does not cause modification of a user's name or domain.

When you use aliases, you greatly simplify the configuration process. When there are a large number of domains and you use aliases, it reduces the configuration volume, thus requiring less NVS and memory usage.

Example 1 In this example, an administrator wants to associate all subscribers of a PPP interface with a specific domain name.

1. Create an AAA profile.

   host1(config)#**aaa profile forwardToXyz**

2. Map the original domain name to the mapped domain name for domain map lookup.

   host1(config-aaa-profile)#**translate default xyz.com**

3. Associate the AAA profile with the designated PPP interface.

   host1(config-if)#**ppp aaa-profile forwardToXyz**

When configured as such, the following scenario is typical:

- PPP passes the AAA profile **forwardToXyz** to AAA in the authentication request.
- AAA performs the following tasks:
  - Receives the authentication request from PPP with the subscriber's name **morris@abc.com**.
  - Parses the domain name **abc.com** and examines the specified AAA profile **forwardToXyz**.
  - Determines that the AAA profile **forwardToXyz** is valid.
  - Searches **forwardToXyz** for a match on the PPP subscriber's domain name and finds no match.

- Searches **forwardToXyz** for a match on the domain name **default**.
- Finds a match and continues as normal using the domain name **xyz.com**.

NOTE: If there is no matching entry in the AAA profile for the user's domain name or for the domain name **default**, then AAA continues processing as if there were no AAA profile.

If the user's name does not contain a domain name, then AAA attempts to match to the domain name **none** in the AAA profile. If there is no entry for **none**, then AAA attempts to match for the domain name **default** in the AAA profile. If there is no entry for either **none** or **default**, then AAA continues processing as if there were no AAA profile.

Example 2 In this example, an administrator wants to use aliases; that is, to associate multiple domain names with a specific domain name and not allow other domain names.

1. Create an AAA profile.

   host1(config)#**aaa profile toAbc**

2. Map the original domain name to the mapped domain name for domain map lookup.

   host1(config-aaa-profile)#**translate abc1.com abc.com**
   host1(config-aaa-profile)#**translate abc2.com abc.com**
   host1(config-aaa-profile)#**translate abc3.com abc.com**

3. Specify the domain name you want to restrict.

   host1(config-aaa-profile)#**deny default**

4. Associate the AAA profile with the designated PPP interface.

   host1(config-if)#**ppp aaa-profile toAbc**

When configured as such, the following scenario is typical:

- PPP passes the AAA profile **toAbc** to AAA in the authentication request.
- AAA:
  - Receives the authentication request from PPP with the subscriber's name **jane@abc1.com**
  - Parses the domain name **abc1.com** and examines the specified AAA profile **toAbc**
  - Determines that the AAA profile **toAbc** is valid

- Searches **toAbc** for a match on the PPP subscriber's domain name and finds a match
- Continues as normal using the domain name **abc.com**

NOTE: If there is no matching entry in the AAA profile for the user's domain name or for the domain name **default**, then AAA continues processing as if there were no AAA profile.

If the user's name does not contain a domain name, then AAA attempts to match to the domain name **none** in the AAA profile. If there is no entry for **none**, then AAA attempts to match for the domain name **default** in the AAA profile. If there is no entry for either **none** or **default**, then AAA continues processing as if there were no AAA profile.

aaa profile

- Use to configure a new AAA profile.
- Example

  host1(config)#**aaa profile boston123**

- Use the **no** version to delete the AAA profile.

allow

- Use to specify the domain name(s) that you want to be allowed access to AAA authentication.
- This command does not indicate that the user will be granted access; it is simply the first access point to AAA authentication.
- Using this command does not implicitly deny all other domains.
- Example

  host1(config-aaa-profile)#**allow xyz.com**

- Use the **no** version to negate the command.

deny

- Use to specify the domain name(s) that you want to be denied access to AAA authentication.
- Example

  host1(config-aaa-profile)#**deny xyz.com**

- Use the **no** version to negate the command.

ppp aaa-profile

- Use to assign an AAA profile to static and dynamic, multilink and nonmultilink PPP interfaces.
- The PPP application associates the AAA profile with the interface and passes the AAA profile to AAA for authentication.
- If an AAA profile is deleted after it has been assigned to an interface, AAA will deny the authentication and log a message.
- When you remove an AAA profile, it does not remove any corresponding bindings between PPP interfaces or interface profiles and the AAA profile. If an AAA profile with the same name is added, the interface cannot authenticate until the AAA profile is reassigned.

NOTE: Although an AAA profile and an interface profile have similar functionality, they are not related and should be treated differently.

- Example

  host1(config-if)#**ppp aaa-profile westford24**

- Use the **no** version to remove the AAA profile assignment.

translate

- Use to map the original domain name to the mapped domain name for domain map lookup.
- This command allows you to group multiple domain names into a single domain name (that is, to use aliases).
- You can use this command to partition PPP subscribers with the same domain into separate domains, based on the PPP interface. By doing this, you do not cause modification of the user's name or domain.
- Example

  host1(config-aaa-profile)#**translate abc.com xyz.com**

- Use the **no** version to negate the command.

Manually Setting NAS-Port-Type Attribute

You can manually configure the NAS-Port-Type RADIUS attribute (attribute 61) in AAA profiles for ATM and Ethernet interfaces. Doing so allows AAA profiles to determine the NAS port type for a given connection.

To set the NAS-Port-Type attribute for ATM or Ethernet interfaces:

1. Create an AAA profile.

   host1(config)#**aaa profile nasPortType**

2. (Optional) Set the NAS-Port-Type attribute for ATM interfaces.

   host1(config-aaa-profile)#**nas-port-type atm wireless-80211**

3. (Optional) Set the NAS-Port-Type attribute for Ethernet interfaces.

   host1(config-aaa-profile)#**nas-port-type ethernet wireless-cable**

aaa profile

- Use to create and configure a AAA profile.
- Example

  host1(config)#**aaa profile nasPortType**

- Use the **no** version to delete the AAA profile.

nas-port-type atm

- Use to specify the RADIUS NAS-Port-Type attribute (61) for ATM interfaces. You can set the attribute to:
  - *value*—Number in the range 0–65535
  - **adsl-cap**—Asymmetric DSL, carrierless amplitude phase (CAP) modulation
  - **adsl-dmt**—Asymmetric DSL, discrete multitone (DMT)
  - **cable**
  - **iapp**—Inter Access Point Protocol (IAPP)
  - **idsl**—ISDN DSL
  - **sdsl**—Symmetric DSL
  - **wireless-1x-ev**—Wireless 1xEV
  - **wireless-80211**—Wireless 802.11
  - **wireless-cdma**—Wireless code division multiple access (CDMA)
  - **wireless-other**
  - **wireless-umts**—Wireless universal mobile telecommunications system (UMTS)
  - **xdsl**—DSL of unknown type

- Example

  host1(config-aaa-profile)#**nas-port-type atm wireless-80211**

- Use the **no** version to remove the NAS-Port-Type setting for ATM interfaces.

nas-port-type ethernet

- Use to specify the RADIUS NAS-Port-Type attribute (61) for Ethernet interfaces. You can set the attribute to:
  - *value*—Number in the range 0–65535
  - **cable**
  - **iapp**—IAPP
  - **wireless-1x-ev**—Wireless 1xEV
  - **wireless-80211**—Wireless 802.11
  - **wireless-cdma**—Wireless CDMA
  - **wireless-other**
  - **wireless-umts**—Wireless UMTS
- Example

  host1(config-aaa-profile)#**nas-port-type ethernet wireless-80211**

- Use the **no** version to remove the NAS-Port-Type setting for Ethernet interfaces.

Service-Description Attribute

You can specify a service description that will be associated with an AAA profile. The description can then be exported through RADIUS by the Service-Description attribute (RADIUS attribute 26-53) in AAA profiles.

To set the Service-Description attribute:

1. Create the AAA profile.

   host1(config)#**aaa profile xyzCorpPro2**

2. Set the Service-Description attribute.

   host1(config-aaa-profile)#**service-description bos-xyzcorp**

aaa profile

- Use to create and configure a AAA profile.
- Example

  host1(config)#**aaa profile xyzCorpPro2**

- Use the **no** version to delete the AAA profile.

service-description

- Use to specify a description that is associated with the AAA profile. The description can be transmitted to RADIUS in the Service-Description attribute (26-53)
- The service description can be a maximum of 64 characters.
- Example

  host1(config-aaa-profile)#**service-description service11**

- Use the **no** version to remove the service description for the profile.

Using RADIUS Route-Download Server to Distribute Routes

The JUNOSe RADIUS route-download server provides periodic automatic distribution of IPv4 static access routes, which enables preconfiguration and preadvertising of access routes before they are assigned to clients. Using the route-download server helps eliminate routing protocol storms and other delays in client service activation that can be caused by protocol convergence or a large number of simultaneous customer activations.

The RADIUS route-download server periodically sends a RADIUS Access-Request message to the RADIUS server to request that routes be downloaded. The RADIUS server then responds with an Access-Accept message and downloads the configured routes. When the download operation is complete, the route-download server installs the access routes in the routing table.

JUNOSe software supports the creation of one RADIUS route-download server per chassis.

Format of Downloaded Routes

The RADIUS server sends the downloaded routes to the RADIUS route-download server in the following format:

[{ vir | virtual-router } *virtualRouterName*] [vrf *vrfName*] prefix-mask [{ null0 | null 0 } [cost]] [tag *tagValue*]
The route-download server accepts downloaded routes in either the Framed-Route attribute (RADIUS attribute 22) or the Cisco-AVpair attribute (Cisco VSA 26-1).

Downloaded Route Format Examples

Framed-Route (RADIUS attribute 22)

NAS-1 Password = “14raddlsvr” User-Service-Type = Outbound-User
Framed-Route = “192.168.3.0 255.255.255.0 null0”
Framed-Route = “vrf vrfboston 192.168.1.0/24 null 0 0 tag 6”
Framed-Route = “vir host1 vrf vrfsunny 192.168.0.0/16 null0 0 tag 8”

Cisco-AVPair (Cisco VSA 26-1)

NAS-1 Password = “14raddlsvr” User-Service-Type = Outbound-User
cisco-avpair = “ip:route = 192.168.3.0 255.255.255.0 null0”
cisco-avpair = “ip:route = vrf vrfboston 192.168.1.0/24 null 0 0 tag 6”
cisco-avpair = “ip:route = vir host1 vrf vrfsunny 192.168.0.0/16 null0 0 tag 8”

NOTE: The prefix-mask entry in downloaded routes can be in the form of prefix length, prefix mask, or prefix. If prefix is used, the mask is determined by the IP address class of the prefix.

How the Route-Download Server Downloads Routes

The route-download server starts the initial route-download operation (for example, after a system reboot or the first time the route-download server is enabled) as soon as IP is established in the virtual router in which the download is performed. After the initial route-download process is established, the router repeats the route download operation based on either the default download schedule or the schedule you specify. You can also initiate an immediate route download at any time.

The RADIUS route-download server downloads routes in two stages—first, all routes are downloaded from the RADIUS server to the router's download database and examined for errors. Next, the router updates the routing table with the new routes, using the following guidelines:

- Adds all downloaded routes that are not already installed in the routing table
- Does not add downloaded routes that are already installed in the routing table
- Deletes routes from the routing table that do not appear in the newly downloaded group

Configuring the Route-Download Server to Download Routes

When you configure the E-series router as a route-download server, you specify the RADIUS server that you want to download the routes to your router. You can also modify the route-download server's default configuration parameters, such as when to start the download process each day, how often to downloaded routes, and how long to wait after a download error before retrying the process.

To configure a RADIUS route-download server:

1. Specify the IP address and the key of the RADIUS server that you want to download routes.

   host1(config)#**radius route-download server 192.168.1.17**
   host1(config-radius)#**key 35radsrv92**

2. (Optional) Specify the UDP port used for RADIUS route-download server requests.

   host1(config-radius)#**udp-port 1812**
   host1(config-radius)#**exit**
   host1(config)#

3. Enable the route-download feature and optionally modify default parameters as needed.

   host1(config)#**aaa route-download 1200 retry-interval 25 password dl1456atl synchronization 03:45:00**

4. (Optional) Verify your route-download configuration:

```
host1(config)#exit
host1#show aaa route-download

AAA Route Downloader:     configured in virtual router default
Download Interval:        1200 minutes
Retry Interval:           25 minutes
Default Cost:             2
Default Tag:              0
Base User Name:           <HOSTNAME>
Password:                 dl1456atl
Synchronization:          03:45:00

Status:                   downloading
Last Download Attempt:    TUE FEB 9 22:07:30 2007
Last Download Success:    <NEVER>
Last Regular Download:    not complete
Next Download Scheduled:  <DOWNLOAD ACTIVE>
Next Regular Download:    WED FEB 9 22:27:00 2007
```

aaa route-download

- Use to enable the RADIUS route-download server on the router and to configure parameters for the server. You can configure the following parameters:
  - **download interval**—The amount of time the route-download server waits between route download operations. The newly created server downloads routes as soon as the IP protocol is active on the virtual router that performs the route download operation, and then repeats the download operation every 720 minutes by default. You can set a download interval in the range 1–1440 minutes.
  - **retry-interval**—The amount of time the server waits after a download failure before attempting another route download. You can set the retry interval in the range 1–60 minutes. The default interval is 10 minutes.

NOTE: If the download interval is less than the retry interval, the server ignores the retry interval setting.

  - **cost**—The cost of a downloaded route. You can specify a cost in the range 1–254. The default cost is 2.
  - **tag**—The tag assigned to a downloaded route. You can specify a tag in the range 1–4294967295. The default tag is 0.
  - **base-user-name**—The virtual router that is used for route-download requests. The default name is the router hostname.
  - **password**—The password used in RADIUS Access-Request messages for route-download requests. You can specify from 1 through 32 alphanumeric characters. The default password is juniper.
  - **synchronization**—The time that the server starts the route download operation each day. You specify the time in 24-hour format, for example 03:45:00.

- Example

  host1(config)#**aaa route-download 1200 retry-interval 25 password dl1456atl synchronization 03:45:00**

- Use the **no** version to disable the route-download server.

aaa route-download now

- Use to specify that the RADIUS route-download server immediately restart the route download operation.
- If a download is currently in progress when you issue this command without the **force** keyword, the in-progress download continues until complete. No additional download is started.
- Use the **force** keyword to start an immediate download; a currently running download is interrupted. The download is not retried if it fails.
- Use the **adjust-scheduler** keyword to restart the configured download interval from the time of this download. However, if the download fails, the download interval is not changed and the download is not retried.
- Example

  host1#**aaa route-download now force adjust-scheduler**

- There is no **no** version.

aaa route-download suspend

- Use to temporarily suspend the RADIUS route-download server operation.
- Example

  host1#**aaa route-download suspend**

- Use the **no** version to restore the route download operation.

clear ip routes download

- Use to synchronize downloaded access routes and the routes that are installed in the routing tables of virtual routers.
- Use the following options to synchronize downloaded routes for a specific virtual router:
  - Specify a particular VRF whose downloaded routes you want synchronized. If you do not specify an optional VRF, the current virtual router is used.
  - Specify the IP address and IP mask that identifies the subset of downloaded routes that you want cleared in the routing table of the current virtual router or in the specified VRF.
  - Use the wildcard character (*****) to clear all downloaded routes in the routing table of the current virtual router or in the specified VRF.

- Use the following keywords to perform global clearing operations:
  - **all**—Clears all downloaded routes from all virtual routers and VRFs.
  - **reload**—Initiates a download of routes and then clear the routes from the routing table of all virtual routers and VRFs.

NOTE: Clear commands fail if the route-download server is in the process of downloading routes from the RADIUS server.

- Example 1—Clear all downloaded routes from the current virtual router

  host1#**clear ip routes download ***

- Example 2—Clear a subset of routes from a specific VRF

  host1#**clear ip routes download vrf NY12 192.168.50.102 255.255.0.0**

- Example 3—Clear all downloaded routes from all virtual routers and VRFs

  host1#**clear ip routes download all**

- There is no **no** version.

radius route-download server

- Use to configure a RADIUS route-download server and enter RADIUS Configuration mode. Specify the IP address of the RADIUS server that you want to download access routes.

NOTE: When the RADIUS route-download server is enabled, the router ignores the **radius rollover-on-reject enable** command—the **radius rollover-on-reject enable** command has no effect for a RADIUS route-download server.

- You can configure a single instance of the route downloader on the router.
- Example

  host1(config)#**radius route-download server 10.10.5.10**
  host1(config-radius)#

- Use the **no** version to delete the instance of the RADIUS route-download server.

Using the AAA Logical Line Identifier to Track Subscribers

You can configure the router to support the AAA logical line identification feature. This feature enables service providers to track subscribers on the basis of a virtual port known as the logical line ID (LLID).

The LLID is an alphanumeric string that logically identifies a subscriber line. The service provider maps each subscriber to an LLID based on the user name and circuit ID from which the customer's calls originate. When a subscriber moves to a new physical line, the service provider's customer profile database is updated to map to the same LLID.

Because a subscriber's LLID remains the same regardless of the subscriber's physical location, using the LLID gives service providers a more secure mechanism for tracking subscribers and maintaining the customer database.

How the Router Obtains and Uses the LLID

To obtain an LLID for a subscriber, the router must issue two RADIUS access requests: a preauthentication request to obtain the LLID, followed by an authentication request encoded with the LLID returned in response to the preauthentication request.

To configure this feature, you:

1. Create an AAA profile that supports preauthentication (by using the **pre-authenticate** command in AAA Profile Configuration mode).

2. Specify the IP address of a RADIUS preauthentication server (by using the **radius pre-authentication server** command in Global Configuration mode) and of an authentication server (by using the **radius authentication server** command in Global Configuration mode).

The following steps describe how the router uses RADIUS to obtain and use the LLID. It is assumed that you have already configured an AAA profile for preauthentication and have defined both a RADIUS preauthentication server and a RADIUS authentication server. Typically, the preauthentication server and the authentication server reside in the same virtual router context in which the PPP subscriber is authenticated.

The router obtains and uses the LLID as follows:

1. A PPP subscriber requests authentication through RADIUS.

2. The router sends an Access-Request message to the RADIUS preauthentication server to obtain an LLID for the subscriber.

   This step is referred to as the preauthentication request because it occurs before user authentication and authorization.

3. The preauthentication server returns the LLID to the router in the Calling-Station-Id (RADIUS attribute 31) of an Access-Accept message.

   The router ignores any RADIUS attributes other than the Calling-Station-Id that are returned in the preauthentication Access-Accept message.

4. The router encodes the LLID in the RADIUS Calling-Station-Id and sends an Access-Request message to the RADIUS authentication server.

   This step is referred to as the authentication request.

5. The RADIUS authentication server returns an Access-Accept message to the router that includes the tunnel attributes for the subscriber session.

6. For tunneled PPP subscribers, the router, acting as an L2TP access concentrator (LAC), encodes the LLID into L2TP Calling Number AVP 22 and sends this to the L2TP network server (LNS) in an incoming-call request (ICRQ) packet.

   After a successful preauthentication request, the router always encodes the LLID in Calling Number AVP 22. The use of **aaa** commands such as **aaa tunnel calling-number-format** to control or change the inclusion of the LLID in Calling Number AVP 22 has no effect.

RADIUS Attributes in Preauthentication Request

Table 6 describes the RADIUS IETF attributes that are always included in a preauthentication request to obtain the LLID. The attributes are listed in ascending order by standard number.

Table 6: RADIUS IETF Attributes in Preauthentication Request

Attribute Number	Attribute Name	Description
[1]	User-Name	Name of the user associated with the LLID, in the format: NAS-Port: < NAS-IP-Address > : < Nas-Port-Id > For example, nas-port:172.28.30.117:atm 4/1.104:2.104
[2]	User-Password	Password of the user to be authenticated; always set to "juniper"
[4]	NAS-IP-Address	IP address of the network access server (NAS) that is requesting authentication of the user; for example, 172.28.30.117
[5]	NAS-Port	Physical port number of the NAS that is authenticating the user; this is always interpreted as a bit field
[6]	Service-Type	Type of service the user has requested or the type of service to be provided; for example, framed
[61]	NAS-Port-Type	Type of physical port the NAS is using to authenticate the user
[77]	Connect-Info	Actual user name; for example, jdoe@xyzcorp.east.com
[87]	NAS-Port-Id	Text string that identifies the physical interface of the NAS that is authenticating the user; for example, atm 4/1.104:2.104

The use of **radius** commands such as **radius calling-station-format** or **radius override calling-station-id** to control or change the inclusion of these attributes in the preauthentication request has no effect.

For more information about these attributes, see *Chapter 6, RADIUS Attribute Descriptions*.

Considerations for Using the LLID

The following considerations apply when you configure the router for subscriber preauthentication:

- Only PPP subscribers authenticating through RADIUS can use the AAA LLID feature on the router. PPP subscribers tunneled through domain maps cannot take advantage of this feature.
- The Calling-Station-Id [31] attribute is typically sent in RADIUS Access-Request messages, not in Access-Accept messages as is the case for this feature. As a result, your RADIUS server might require special configuration procedures to enable the Calling-Station-Id attribute to be returned in Access-Accept messages. See the documentation that came with your RADIUS server for information.
- The router ignores any RADIUS attributes other than the Calling-Station-Id that are returned in the preauthentication Access-Accept message.
- If a preauthentication request fails due to misconfiguration of the preauthentication server, timeout of the preauthentication server, or rejection of the preauthentication request by the preauthentication server, the authentication process continues normally and the preauthentication request is ignored.
- The router preserves the LLID value for established subscribers after a stateful SRP switchover.
- The **radius rollover-on-reject enable** command has no effect for a RADIUS preauthentication server. That is, you cannot use the **radius rollover-on-reject enable** command to configure the router to roll over to the next RADIUS preauthentication server when the router receives an Access-Reject message for the user it is authenticating. For information, see **radius rollover-on-reject** on page 32.

Configuring the Router to Obtain the LLID for a Subscriber

To configure the router to obtain the LLID for a subscriber:

1. Create an AAA profile that supports subscriber preauthentication.

   host1(config)#**aaa profile preAuthLlid**
   host1(config-aaa-profile)#**pre-authenticate**
   host1(config-aaa-profile)#**exit**

2. Define a RADIUS preauthentication server.

   host1(config)#**radius pre-authentication server 10.10.10.1**
   host1(config-radius)#**key abc123**
   host1(config-radius)#**exit**

3. Associate the AAA profile with the designated PPP interface.

   host1(config)#**interface atm 4/3.101**
   host1(config-subif)#**ppp aaa-profile preAuthLlid**

4. (Optional) Verify that preauthentication support is configured for the AAA profile.

```
host1(config-subif)#run show aaa profile name PreAuthLlid
preAuthLlid:
    atm nas-port-type: ADLSL-CAP
    ethernet nas-port-type: Cable
    profile-service-description: xyzService
    pre-authenticate
    allow xyz.com
    deny default
    translate xyz1.com abc.com
```

For information, see **show aaa profile command** in *Chapter 2, Monitoring and Troubleshooting Remote Access*.

5. (Optional) Verify configuration of the RADIUS preauthentication server.

```
host1(config-subif)#run show radius pre-authentication servers

               RADIUS Pre-Authentication Configuration
               ---------------------------------------
                Udp    Retry             Maximum    Dead
 IP Address     Port   Count   Timeout   Sessions   Time   Secret
-------------   ----   -----   -------   --------   ----   ------
10.10.10.1      1812   3       3         255        0      radius
```

You can also display configuration information for preauthentication servers by using the **show radius servers** command. For information, see **show radius servers command** in *Chapter 2, Monitoring and Troubleshooting Remote Access*.

6. (Optional) Display statistics for the RADIUS preauthentication server.

To display preauthentication statistics, use the **show radius pre-authentication statistics** command. For information, see **show radius statistics command** in *Chapter 2, Monitoring and Troubleshooting Remote Access*.

To display a count of preauthentication requests and responses, use the **show aaa statistics** command. For information, see **show aaa statistics command** in *Chapter 2, Monitoring and Troubleshooting Remote Access*.

aaa profile

- Use to configure a new AAA profile.
- Example

  host1(config)#**aaa profile boston123**

- Use the **no** version to delete the AAA profile.

key

- Use from RADIUS Configuration mode to configure the secret for a RADIUS preauthentication server.
- The server secret is a text string used by RADIUS to encrypt the client and server authenticator field during exchanges between the router and a RADIUS preauthentication server. The router encrypts PPP PAP passwords using this text string.
- The default behavior is no server secret.
- Example

  host1(config-radius)#**key gismo**

- Use the **no** version to remove the secret.

NOTE: The preauthentication request fails if you do not specify a key for the preauthentication server.

ppp aaa-profile

- Use to assign an AAA profile to static and dynamic, multilink and nonmultilink PPP interfaces.
- For more information about how to use this command, see **ppp aaa-profile** on page 65**.**
- Example

  host1(config-if)#**ppp aaa-profile preAuth**

- Use the **no** version to remove the AAA profile assignment.

pre-authenticate

- Use to configure an AAA profile to support RADIUS preauthentication.
- During preauthentication, the router sends an Access-Request message to a RADIUS preauthentication server to obtain an LLID for a subscriber. In response, the preauthentication server returns the LLID in the RADIUS Calling-Station-Id [31] attribute of an Access-Accept message.
- Example

  host1(config-aaa-profile)#**pre-authenticate**

- Use the **no** version to remove preauthentication support from the AAA profile.

radius pre-authentication server

- Use to specify the IP address of a RADIUS preauthentication server.
- This command accesses RADIUS Configuration mode, from which you can configure additional parameters for the RADIUS preauthentication server.

- Example

  host1(config)#**radius pre-authentication server 10.10.10.2**

- Use the **no** version to delete the instance of the RADIUS preauthentication server.

Troubleshooting Subscriber Preauthentication

You can configure the router to send traps to SNMP when a RADIUS preauthentication server fails to respond to messages. To do so, you use the same procedure and commands as you do to configure SNMP traps for a RADIUS authentication server.

For example, to enable SNMP traps when a particular RADIUS preauthentication server fails to respond to Access-Request messages, use the **radius trap auth-server-not-responding enable** command.

For more information, see *Configuring SNMP Traps* on page 36.

Using VSAs for Dynamic IP Interfaces

Table 7 describes the VSAs that apply to dynamic IP interfaces and are supported on a per-user basis from RADIUS. For details, see *JUNOSe Link Layer Configuration Guide, Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

Table 7: VSAs That Apply to Dynamic IP Interfaces

VSA	Description	Type	Length	Subtype	Subtype Length	Value
Ingress-Policy-Name	Specifies the name of the input (ingress) policy	26	len	10	sublen	string: *input-policy-name*
Egress-Policy-Name	Specifies the name of the output (egress) policy	26	len	11	sublen	string: *output-policy-name*
Ingress-Statistics	Indicates whether statistics are collected on input	26	12	12	6	integer: 0 – disable, 1 – enable
Egress-Statistics	Indicates whether statistics are collected on output	26	12	13	6	integer: 0 – disable, 1 – enable
QoS-Profile-Name	Specifies the name of the QoS profile to attach to the interface	26	len	26	sublen	string: *qos-profile-name*

To use the VSAs shown in Table 7:

- Specify the policy, or one or more QoS VSAs in the desired RADIUS user entries.
- Create the ingress or egress policy, or the QoS profile. Policies minimally consist of one or more policy commands and may include classifier control lists and rate limit profiles. See the *JUNOSe Policy Management Configuration Guide* for more information about policies and policy routing. See the *JUNOSe Quality of Service Configuration Guide* for information about creating QoS profiles.

When a dynamic interface is created according to a profile, the router checks with RADIUS to determine whether an input or output policy or a QoS profile must be applied to the interface. The VSA, if present, provides the name, enabling policy or QoS profile lookup. If found, the policy or QoS profile is applied to the dynamic interface.

The router also determines whether the creation profile specifies any policies to be applied to the interface. Policies specified by the RADIUS VSA supersede any specified by the profile, as described in the following example:

> The RADIUS user entry includes an Ingress-Policy-Name VSA that specifies the policy input5. The profile specifies two policies, input7 and output1. In this case, the RADIUS-specified input policy (input5) and the profile-specified output policy (output1) are applied to the dynamic interface.

For information about assigning policies via profiles, see the *JUNOSe Policy Management Configuration Guide*. Only attributes assigned by RADIUS appear in RADIUS Acct-Start messages. RADIUS attributes specified by a profile for dynamic interfaces do not appear in RADIUS Acct-Start messages because the profile is not active when the Acct-Start message is generated. These attributes appear in RADIUS Acct-Stop messages for a profile that is active when the session is terminated.

Traffic Shaping for PPP over ATM Interfaces

The router supports the configuration of traffic shaping parameters for PPP over ATM (PPPoA) via domain-based profiles and RADIUS. In connection with this feature, Table 8 describes VSAs that apply to dynamic IP interfaces and are supported on a per-user basis from RADIUS.

Table 8: Traffic-Shaping VSAs That Apply to Dynamic IP Interfaces

VSA	Description	Type	Length	Subtype	Subtype Length	Value
Service-Category	Specifies the type of service	26	12	14	6	integer: 1 – UBR 2 – UBR PCR 3 – NRT VBR 4 – CBR 5 – RT VBR
PCR	Specifies the value for the peak cell rate (PCR)	26	12	15	6	integer
SCR	Specifies the value for the sustained cell rate (SCR)	26	12	16	6	integer
MBS	Specifies the maximum burst size (MBS)	26	12	17	6	integer

To configure traffic-shaping parameters for PPPoA via domain maps, use the **atm** command in Domain Map Configuration mode.

atm

- Use to configure traffic-shaping parameters for PPPoA.
- Use one of the following keywords to select the traffic category to configure:
  - **ubr**—Unspecified bit rate
  - **ubrpcr—**Unspecified bit rate with peak cell rate
  - **nrtvbr**—Non–real time variable bit rate
  - **rtvbr**—Real time variable bit rate
  - **cbr**—Constant bit rate
- Example

  host1(config)#**aaa domain-map atmTraffic**
  host1(config-domain-map)#**atm rtvbr 3897832145 3597861230 4294967295**

- Use the **no** version to remove the traffic-shaping configuration.

Mapping Application Terminate Reasons to RADIUS Terminate Codes

The JUNOSe software uses a default configuration that maps terminate reasons to RADIUS Acct-Terminate-Cause attributes. You can optionally create customized mappings between a terminate reason and a RADIUS Acct-Terminate-Cause attribute—these mappings enable you to provide different information about the cause of a termination.

When a subscriber's L2TP or PPP session is terminated, the router logs a message for the internal terminate reason and logs another message for the RADIUS Acct-Terminate-Cause attribute (RADIUS attribute 49). RADIUS attribute 49 is also included in RADIUS Acct-Off and Acct-Stop messages. You can use the logged information to help monitor and troubleshoot terminated sessions.

Use the **show terminate-code** command to display information about the mappings between application terminate reasons and RADIUS Acct-Terminate-Cause attributes.

Table 9 lists the IETF RADIUS Acct-Terminate-Cause codes that you can use to map application terminate reasons. In addition, you can also configure and use proprietary codes for values beyond 22.

Table 9: Supported RADIUS Acct-Terminate-Cause Codes

Code	Name	Description
1	User Request	User initiated the disconnect (log out)
2	Lost Carrier	DCD was dropped on the port
3	Lost Service	Service can no longer be provided; for example, the user's connection to a host was interrupted
4	Idle Timeout	Idle timer expired
5	Session Timeout	Subscriber reached the maximum continuous time allowed for the service or session
6	Admin Reset	System administrator reset the port or session

Table 9: Supported RADIUS Acct-Terminate-Cause Codes (continued)

Code	Name	Description
7	Admin Reboot	System administrator terminated the session on the NAS; for example, prior to rebooting the NAS
8	Port Error	NAS detected an error on the port that required ending the session
9	NAS Error	NAS detected an error (other than on the port) that required ending the session
10	NAS Request	NAS ended the session for a non-error reason
11	NAS Reboot	NAS ended the session due to a non-administrative reboot
12	Port Unneeded	NAS ended the session because the resource usage fell below the low threshold; for example, the bandwidth-on-demand algorithm determined that the port was no longer needed
13	Port Preempted	NAS ended the session to allocate the port to a higher-priority use
14	Port Suspended	NAS ended the session to suspend a virtual session
15	Service Unavailable	NAS was unable to provide the requested service
16	Callback	NAS is terminating the current session in order to perform callback for a new session
17	User Error	An error in the user input caused the session to be terminated
18	Host Request	The login host terminated the session normally
19	Supplicant Restart	Supplicant state machine was reinitialized
20	Reauthentication Failure	A previously authenticated supplicant failed to reauthenticate successfully following expiration of the reauthentication timer or explicit reauthentication request by management action
21	Port Reinitialized	The port's MAC has been reinitialized
22	Port Administratively Disabled	The port has been administratively disabled

Configuration Example

This example describes a sample configuration procedure that creates custom mappings for PPP terminate reasons.

1. Configure the router to include the Acct-Terminate-Cause attribute in RADIUS Acct-Off messages.

```
host1(config)#radius include acct-terminate-cause acct-off enable
```

2. (Optional) Display the current PPP terminate-cause mappings.

```
host1(config)#run show terminate-code ppp
                                                                    Radius
  Apps          Terminate Reason              Description            Code
---------   -------------------------   -------------------------   ------
ppp         authenticate-authenticator  authenticate authenticator    17
            -timeout                     timeout
ppp         authenticate-challenge-tim  authenticate challenge tim    10
            eout                        eout
ppp         authenticate-chap-no-resou  authenticate chap no resou    10
            rces                        rces
```

```
ppp         authenticate-chap-peer-aut   authenticate chap peer aut     17
            henticator-timeout           henticator timeout
ppp         authenticate-deny-by-peer    authenticate deny by peer      17
ppp         authenticate-inactivity-ti   authenticate inactivity ti     4
            meout                        meout
 --More--
```

3. (Optional) Display all PPP terminate reasons.

```
host1(config)#terminate-code ppp ?
  authenticate-authenticator-timeout           Configure authenticate
                                               authenticator timeout
                                               translation
  authenticate-challenge-timeout               Configure authenticate
                                               challenge timeout translation
  authenticate-chap-no-resources               Configure authenticate chap no
                                               resources translation
  authenticate-chap-peer-authenticator-timeout Configure authenticate chap
                                               peer authenticator timeout
                                               translation
  authenticate-deny-by-peer                    Configure authenticate deny by
                                               peer translation
 --More--
```

4. Configure your customized PPP terminate-cause to RADIUS Acct-Terminate-Cause code mappings.

```
host1(config)#terminate-code ppp authenticate-authenticator-timeout radius 3
host1(config)#terminate-code ppp authenticate-challenge-timeout radius 4
```

5. Verify the new terminate-cause mappings.

```
host1(config)#run show terminate-code ppp
                                                                      Radius
  Apps          Terminate Reason              Description             Code
---------   --------------------------   --------------------------   ------
ppp         authenticate-authenticator   authenticate authenticator     3
            -timeout                      timeout
ppp         authenticate-challenge-tim   authenticate challenge tim     4
            eout                         eout
ppp         authenticate-chap-no-resou   authenticate chap no resou     10
            rces                         rces
ppp         authenticate-chap-peer-aut   authenticate chap peer aut     17
            henticator-timeout           henticator timeout
ppp         authenticate-deny-by-peer    authenticate deny by peer      17
ppp         authenticate-inactivity-ti   authenticate inactivity ti     4
            meout                        meout
ppp         authenticate-max-requests    authenticate max requests      10
 --More--
```

radius include acct-terminate-cause

- Use to include the Acct-Terminate-Cause attribute (RADIUS attribute 49) in RADIUS Acct-Off messages.
- You control inclusion of the Acct-Terminate-Cause attribute by enabling or disabling this command.

- Example

  host1(config)#**radius include acct-terminate-cause acct-off disable**

- Use the **no** version to restore the default, enable.

terminate-code

- Use to configure a customized mapping relationship between an application's terminate reason and a RADIUS Acct-Terminate-Cause code (RADIUS attribute 49).
- To set up the mapping, specify the following variables with this command:
  1. Specify the application where the terminate event occurs. You can specify **aaa**, **l2tp**, **ppp**, or **radius-client**.
  2. Specify the application's terminate reason that you want to map.
     - Use the question mark character (**?**) to display a list of the application's terminate reasons. For example:

       host1(config)#**terminate-code l2tp ?**

     - See *Chapter 7, Application Terminate Reasons* for a list of the default terminate reasons for the AAA, L2TP, PPP, and RADIUS client applications.
  3. Specify RADIUS as the translation application that is used for mapping. Then, specify the RADIUS Acct-Terminate-Cause code that you want to map to the application's terminate reason. See Table 9 on page 80 for a list of supported RADIUS codes.
- Example

  host1(config)#**terminate-code ppp authenticate-challenge-timeout radius 4**

- Use the **no** version to restore a default mapping, which are listed in *Chapter 7, Application Terminate Reasons*. For example:

  host1(config)#**no terminate-code aaa deny-address-allocation-failure radius**

Configuring Timeout

You can configure an idle or a session timeout. The values you set are the default values for PPP B-RAS users. Attributes returned by RADIUS override these default settings on a per-user basis.

aaa timeout

- Use to set either an idle or a session timeout.
- The range in seconds for an idle timeout is 300–86400.
- The range in seconds for a session timeout is a minimum of 1 minute (60 seconds) through a maximum of 366 days (31622400 seconds).

- These values can also be set by RADIUS, where the range is not enforceable. PPP and L2TP will round the timeout values from RADIUS as follows:
  - If the session timeout is less than the minimum (60 seconds), that value is used.
  - If the idle timeout is less than the minimum (300 seconds), it is rounded up to the minimum.
  - If either timeout is greater than the maximum, it is rounded down to the maximum.
  - All other timeouts are rounded to the nearest minute.
- Example 1

  host1(config)#**aaa timeout idle 1200**

- Example 2

  host1(config)#**aaa timeout session 3600**

- For a session timeout, the router interprets the default value (indicated by **0**) to mean that the PPP or L2TP user session should be forced to the maximum session timeout, 366 days. This means that the duration of a PPP or an L2TP user session cannot exceed 366 days; once the maximum session timeout is reached, the router terminates the user session.
- Use the **no** version to restore the idle or session timeout to its default value, 0 (seconds).

Limiting Active Subscribers

You can limit the number of active subscribers on a port or virtual router.

aaa subscriber limit per-port

- Use to limit the number of active subscribers permitted on a port.
- Example

  host1(config)#**aaa subscriber limit per-port 2/0 20**

- Use the **no** version to return to the default value, 0 (zero).

aaa subscriber limit per-vr

- Use to limit the number of active subscribers permitted on a virtual router.
- Because profiles are applied to subscribers after the PPP authentication phase, subscribers that have their VR context specified by profiles are not denied access. Instead, when IP notifies AAA of the subscribers VR context, AAA checks limits. If the subscriber exceeds the VR limit, AAA revokes the subscriber's access and logs out the subscriber.
- Example

  host1:vr17(config)#**aaa subscriber limit per-vr 20**

- Use the **no** version to return to the default value, 0 (zero).

Notifying RADIUS of AAA Failure

If a user passes RADIUS authentication, but fails AAA authentication, the RADIUS server may still allocate an address for the user from its internal address pool. To indicate to the RADIUS server to free the address, you can set up the router to send an Acct-Stop message if a user fails AAA.

aaa accounting acct-stop on-aaa-failure

- Use to cause the router to send an Acct-Stop message if a user fails AAA, but RADIUS grants access.
- Example

  host1:vr17(config)#**aaa accounting acct-stop on-aaa-failure disable**

- Use the **no** version to return to the default value, enabled.

aaa accounting acct-stop on-access-deny

- Use to cause the router to issue an Acct-Stop message if RADIUS denies access.
- Example

  host1:vr17(config)#**aaa accounting acct-stop on-access-deny enable**

- Use the **no** version to return to the default value, disabled.

Configuring the SRC Client

The JUNOSe software has an embedded client that interacts with the Juniper Networks SRC software, enabling the SRC software to manage the router's policy and QoS configuration.

The connection between the router and the SRC software uses the Common Open Policy Service (COPS) protocol and is fully compliant with the COPS usage for policy provisioning (COPS-PR) specification. The router's SRC client functions as the COPS client, or policy enforcement point (PEP). The SRC software functions as the COPS server, or policy decision point (PDP).

Table 10 provides common terms used in the COPS environment.

Table 10: SRC Client and COPS Terminology

Term	Description
COPS	Common Open Policy Service; query-and-response protocol used to exchange policy information between a policy server and its clients.
COPS-PR	COPS usage for policy provisioning; the PEP requests policy provisioning when the operational state of interface and DHCP addresses changes.
PDP	Policy decision point; the COPS server. which makes policy decisions for itself and for clients that request decisions. The SRC software is the PDP.
PEP	Policy enforcement point; the COPS client, which enforces policy decisions. The JUNOSe COPS interface is a PEP.
PIB	Policy Information Base; a collection of sets of attributes that represent configuration information for a device.

Table 10: SRC Client and COPS Terminology (continued)

Term	Description
SRC	Session and Resource Control (SRC) software, formerly the Service Deployment System (SDX) software; functions as a COPS PDP.
XDR	External Data Representation Standard; a standard for the description and encoding of data. XDR can be used to transfer data between computers.

The JUNOSe software's COPS-PR implementation uses the outsourcing model that is described in RFC 3084. In this model, the PEP delegates responsibility to the PDP to make provisioning decisions on the PEP's behalf.

The provisioning is event-driven and is based on policy requests rather than on an action taken by an administrator—the provisioning is initiated when the PDP receives external requests and PEP events. Provisioning can be performed in bulk (for example, an entire QoS configuration) or in smaller segments (for example, updating a marking filter). The following list shows the interaction between the PEP and the PDP during the COPS-PR operation.

1. Initial connection
    a. PEP starts the COPS-PR connection with the PDP.
    b. PDP requests synchronization.
    c. PEP sends all currently provisioned policies to PDP.
2. Change of interface state
    a. PEP requests provisioning of an interface from the PDP.
    b. PDP determines policies and sends provisioning data to the PEP.
    c. PEP provisions the policies.
3. PDP requests policy provisioning
    a. PDP determines new policies and sends provisioning data to the PEP.
    b. PEP provisions the policies.

The information exchange between the PDP and PEP consists of data that is modeled in Policy Information Bases (PIBs) and is encoded using the standard ASN.1 basic encoding rules (BERs). The JUNOSe software's COPS-PR support uses a proprietary PIB. The proprietary PIB consists of a series of tables designed to replicate and enhance the XDR functionality that is supported in previous JUNOSe software releases, including the proprietary accounting and address assignment mechanisms. The XDR-encoded commands for the SRC software continue to be supported.

The proprietary PIB provides the Policy Manager and QoS Manager functionality shown in the following lists.

- Policy Manager
  - Committed access rate
  - Packet filtering
  - Policy routing
  - QoS classification and marking
  - Rate limiting
  - Traffic class
- QoS Manager
  - Queues
  - Schedulers
  - Traffic classes

You can configure SRC clients on a per-virtual-router basis. To configure the SRC client:

1. Enable the SRC client. With the CLI **sscc enable** command you can specify either BER-encoded information exchange for COPS-PR or XDR exchange for COPS.

   host1(config)#**sscc enable cops-pr**

2. Specify the IP addresses of up to three service activation engines (SAEs) (primary, secondary, and tertiary). You can optionally specify the port on which the SAEs listen for activity.

   host1(config)#**sscc primary address**
   host1(config)#**sscc secondary address 192.168.12.1 port 3288**

3. (Optional) Enable policy and QoS configuration support for IPv6 interfaces.

   host1(config)#**sscc protocol ipv6**

4. (Optional) Specify on which router the TCP/COPS connection is to be established.

   host1(config)#**sscc transportRouter chicago**

5. (Optional) Specify a fixed source address for the TCP/COPS connection created for an SRC client session.

   host1(config)#**sscc sourceAddress 10.9.123.8**

6. (Optional) Specify a fixed source interface for the TCP/COPS connection.

   host1(config)#**sscc sourceInterface atm 3/0**

7. (Optional) Specify the delay period during which the SRC client waits for a response from the SAE.

   host1(config)#**sscc retryTimer 120**

sscc address

- Use to configure the SRC client with the IP addresses of the SAEs and the ports on which the SAEs listen for activity.
- You can specify primary, secondary, and tertiary SAEs, and the port numbers on which each listens for activity. By default, the SAE listens on port 3288.
- Example

  host1(config)#**sscc primary address 192.168.128.10 port 3288**

- Use the **no** version to remove a specific SAE (primary, secondary, or tertiary) from the list of SAEs.

sscc enable

- Use to enable the SRC client's COPS support in the router.
- Use with the **cops-pr** keyword to enable COPS-PR support; omit the **cops-pr** keyword to enable XDR-based COPS support.
- Example

  host1(config)#**sscc enable cops-pr**

- Use the **no** version to disable the feature.

sscc protocol ipv6

- Use to configure IPv6 support on the SRC client. IPv6 support enables policy and QoS configuration on IPv6 interfaces. The IPv6 support is in addition to the default IPv4 support.
- The SRC client does not support IPv6 policy and QoS configuration when in the XDR mode.
- Example

  host1(config)#**sscc protocol ipv6**

- Use the **no** version to disable IPv6 support on the SRC client.

sscc retryTimer

- Use to specify the delay period (in the range 5–300 seconds) during which the SRC client waits for a response from the SAE.
- If only a primary SAE is configured, the client resends the request to the primary SAE.

- The client attempts to connect to a tertiary SAE only if both the primary and secondary SAEs are unavailable. For example, if the client is connected to the secondary SAE when the delay period expires, the client first tries to connect to the primary SAE before trying the tertiary SAE. The client waits for the length of the delay period before each attempt.
- Example

  host1(config)#**sscc retryTimer 90**

- Use the **no** version to restore the default value, 90 seconds.

sscc sourceAddress

- Use to specify a fixed source address for the TCP/COPS connection created for an SRC client session. This is the local address.
- If you do not specify a source address, the TCP/COPS connection is not bound to a specific source (that is, local) address.
- Example

  host1(config)#**sscc sourceAddress 10.9.123.8**

- Use the **no** version to remove the specified address.

sscc sourceInterface

- Use to specify a fixed source interface for the TCP/COPS connection created for an SRC client session. This is a local interface.
- You may need to set a source interface in cases where a firewall, access control list, or policy configuration exists; and it is important to know what the interface is, or you need to set the interface independently from other protocols that have conflicting requirements.
- If you do not specify a source interface, the TCP/COPS connection is not bound to a specific source (that is, local) interface.
- Example

  host1(config)#**sscc sourceInterface atm 3/0**

- Use the **no** version to remove the source interface.

sscc transportRouter

- Use to specify on which router the TCP/COPS connection is to be established.
- The router can be the same as or different from the router the SRC client session is created in and associated with.
- If you do not specify the transport router for an SRC client session, the transport router defaults to the router associated with the session.
- Example

  host1(config)#**sscc transportRouter chicago**

- Use the **no** version to remove the specified SRC client transport router.

Chapter 2

Monitoring and Troubleshooting Remote Access

Use the commands in this chapter to set baselines for and to monitor remote access.

- Monitoring Subscriber Information on page 131
- Monitoring Application Terminate Reason Mappings on page 134

Use the following commands to monitor PPP interfaces:

- **show ppp interface summary**
- **show ppp interface** <*selective control*>

For details on the **show ppp** commands, see *JUNOSe Link Layer Configuration Guide, Chapter 7, Configuring Point-to-Point Protocol*.

You can use the output filtering feature of the **show** command to include or exclude lines of output based on a text string you specify. For details, see *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

NOTE: AAA and RADIUS statistics are not preserved across a warm restart when stateful SRP Switchover is enabled.

Setting Baselines for Remote Access

You can set baseline statistics using the **baseline** commands. The router implements the baseline by reading and storing the statistics at the time the baseline is set and then subtracting this baseline when you retrieve baseline-relative statistics.

Issue the **delta** keyword with the **show aaa statistics** command to show baselined statistics.

Setting a Baseline for AAA Statistics

You can set a baseline for all AAA statistics.

To set a baseline for AAA statistics:

- Issue the **baseline aaa** command:

  host1#**baseline aaa**

There is no **no** version.

Setting a Baseline for AAA Route Downloads

To set a baseline for route downloads:

- Issue the **baseline aaa route-download** command:

  host1#**baseline aaa route-download**

There is no **no** version.

Setting a Baseline for COPS Statistics

To set a baseline for COPS statistics:

- Issue the **show cops statistics** command:

  host1#**show cops statistics**

There is no **no** version.

Setting a Baseline for Local Address Pool Statistics

To set a baseline for local address pool statistics:

- Issue the **show local pool statistics** command:

  host1#**show local pool statistics**

There is no **no** version.

Setting a Baseline for RADIUS Statistics

To set a baseline for RADIUS statistics:

- Issue the **show radius statistics** command:

  host1#**show radius statistics**

There is no **no** version.

Setting the Baseline for SRC Statistics

To set a baseline for SRC statistics:

- Issue the **show sscc statistics** command:

  host#1**how sscc statistics**

There is no **no** version.

Related Topics

- **baseline aaa** command
- **baseline aaa route-download** command
- **baseline cops** command
- **baseline local pool** command
- **baseline radius** command
- **baseline sscc** command

Monitoring AAA Accounting Configuration

Purpose Display the AAA accounting configuration.

Action To display the **show aaa accounting** command:

```
host1:vrXyz7#show aaa accounting

Accounting duplication set to router vrXyz25
Broadcast accounting uses group groupXyzCompany20
send acct-stop on AAA access deny is enabled
send acct-stop on authentication server access deny is disabled
acct-interval (for PPP Clients) 0
service-acct-interval 0
send immediate-update is enabled
```

Meaning Table 11 lists the **show aaa accounting** command output fields.

Table 11: show aaa accounting Output Fields

Field Name	Field Description
Accounting duplication	Name of the virtual router to which duplicate accounting records are sent to the accounting server
Broadcast accounting	Name of the virtual router groups to which broadcast accounting records are sent to the accounting server
send acct-stop on AAA access deny	Enabled, disabled
send acct-stop on authentication server access deny	Enabled, disabled
acct-interval (for PPP Clients)	Number of minutes between accounting update operations
service-acct-interval	Number of minutes between interim accounting updates for services created by the Service Manager feature
send immediate-update	On receipt of response to Acct-Start message; enabled, disabled

Related Topics

- **show aaa accounting** command

Monitoring AAA Accounting Default

Purpose Display the AAA accounting default method for a subscriber type.

You can view the method used for ATM 1483, IPSec, PPP, RADIUS relay server, and tunnel subscribers, and IP subscriber management interfaces.

Action To display the default AAA accounting method:

```
host1#show aaa accounting tunnel default
radius
```

Related Topics

- **show aaa accounting default** command

Monitoring Accounting Interval

Purpose Display the accounting interval.

Action To display the accounting interval:

```
host1#show aaa accounting interval
acct-interval (for PPP Clients) 10
```

Related Topics

- **show aaa accounting interval** command

Monitoring Specific Virtual Router Groups

Purpose Display the names of a specific virtual router group or of all virtual router groups configured on the router, and of the virtual routers making up the groups.

Action To display the names of a specific virtual router group or of all virtual router groups configured on the router. Display the virtual routers making up the groups:

```
host1#show aaa accounting vr-group
vr-group groupXyzCompany10:
 virtual-router 1 vrXyzA
 virtual-router 2 vrXyzB
 virtual-router 3 vrXyzC
 virtual-router 4 vrXyzD
vr-group groupXyzCompany20:
 virtual-router 1 vrXyzP
 virtual-router 2 vrXyzQ
 virtual-router 3 vrXyzR
 virtual-router 4 vrXyzS
```

Meaning Table 12 lists the **show aaa accounting vr-group** command output fields.

Table 12: show aaa accounting vr-group Output Fields

Field Name	Field Description
vr-group	Name of the virtual router group

Monitoring the Default AAA Authentication Method List

Purpose Display the default AAA authentication method list for a subscriber type. You can view the method list used for ATM 1483 subscribers, IPSec subscribers, IP subscriber management interfaces, PPP subscribers, RADIUS relay subscribers, and tunnel subscribers.

For example, you can verify that the local authentication method is configured for PPP subscribers.

Action To display the default AAA authentication method list for a subscriber type:

```
host1#show aaa authentication ppp default
local none
```

Related Topics

- **show aaa authentication default** command

Monitoring Domain and Realm Name Delimiters

Purpose Display the domain and realm name delimiters, parse order, and parse direction configured on the router.

Action To display the domain and realm name delimiters, parse order, and parse direction configured on the router.

```
host1#show aaa delimiters
domain delimiters "@!"
realm delimiters “/”
parse order is realm-first
domain parse direction is right-to-left
realm parse direction is left-to-right
```

Related Topics

- **show aaa delimiters** command

Monitoring Mapping Between User Domains and Virtual Routers

Purpose Display the mapping between user domains and virtual routers.

The following keywords have significance when used as user domains:

- **none**—All client requests with no user domain name are associated with the virtual router mapped to the **none** entry
- **default**—All client requests with a domain present that have no map are associated with the virtual router mapped to the **default** entry

Action To display the mapping between user domains and virtual routers:

```
host1#show aaa domain-map
Domain: lac-tunnel; router-name: lac; ipv6-router-name: default
Tunnel                Tunnel   Tunnel   Tunnel    Tunnel
 Tag     Tunnel Peer  Source    Type    Medium   Password    Tunnel Id
------   -----------  ------   ------   ------   --------   -----------
5        192.168.1.1  <null>   l2tp     ipv4     welcome    lac-tunnel

                      Tunnel                Tunnel
Tunnel     Tunnel     Server     Tunnel      Max
 Tag     Client Name   Name    Preference   Sessions     Tunnel RWS
------   -----------  ------   ----------   --------   --------------
5        lac          boston   5            0          4

                                                      Tunnel
         Tunnel     Tunnel            Tunnel         Tx
Tunnel   Virtual   Failover           Switch       Speed
 Tag     Router     Resync           Profile      Method
------   -------   --------         ---------     ------
5        <null>    silent failover  denver       qos
```

Meaning Table 13 lists the **show aaa domain-map** command output fields.

Table 13: show aaa domain-map Output Fields

Field Name	Field Description
Domain	Name of the domain
router-name	Virtual router to which user domain name is mapped
tunnel-group	Name of the tunnel group assigned to the domain map
ipv6-router-name	IPv6 virtual router to which user domain name is mapped
local-interface	Interface information to use on the local (E-series) side of the subscriber's interface
ipv6-local-interface	IPv6 interface information to use on the local (E-series) side of the subscriber's interface
poolname	Local address pool from which the router allocates addresses for this domain
IP hint	IP hint is enabled
strip-domain	Strip domain is enabled
override-username	Single username used for all users from a domain in place of the values received from the remote client
override-password	Single password used for all users from a domain in place of the values received from the remote client
Tunnel Tag	Tag that identifies the tunnel
Tunnel Peer	Destination address of the tunnel
Tunnel Source	Source address of the tunnel
Tunnel Type	L2TP
Tunnel Medium	Type of medium for the tunnel; only IPv4 is supported
Tunnel Password	Password for the tunnel

Table 13: show aaa domain-map Output Fields (continued)

Field Name	Field Description
Tunnel Id	ID of the tunnel
Tunnel Client Name	Host name that the LAC sends to the LNS when communicating to the LNS about the tunnel
Tunnel Server Name	Host name expected from the peer (the LNS) when during tunnel startup
Tunnel Preference	Preference level for the tunnel
Tunnel Max Sessions	Maximum number of sessions allowed on a tunnel
Tunnel RWS	L2TP receive window size (RWS) for a tunnel on the LAC; displays either the configured value or the default behavior, which is indicated by `system chooses`
Tunnel Virtual Router	Name of the virtual router to map to the user domain name
Tunnel Failover Resync	L2TP peer resynchronization method
Tunnel Switch Profile	Name of the L2TP tunnel switch profile
Tunnel Tx Speed Method	Method that the router uses to calculate the transmit connect speed of the subscriber's access interface: static layer2, dynamic layer2, qos, actual, not set

Related Topics

- **show aaa domain-map** command

Monitoring Tunnel Subscriber Authentication

Purpose Verify configuration of tunnel subscriber authentication. When authentication is enabled, the output indicates this configuration. When authentication is disabled, the output presents no information about the configuration.

Action To display tunnel subscriber authentication configuration:

```
host1#show aaa domain-map
Domain: tunnel.com; router-name: default; ipv6-router-name: default;
tunnel-subscriber authentication: enable
```

Meaning Authentication is enabled.

Monitoring Routing Table Address Lookup

Purpose Display whether the routing table address lookup or duplicate address check is enabled or disabled.

Action To display whether the routing table address lookup or duplicate address check is enabled or disabled:

```
host1#show aaa duplicate-address-check
enabled
```

Related Topics

- **show aaa duplicate-address-check** command

Monitoring the AAA Model

Purpose Display the AAA model.

Action To display the AAA model:

```
host1#show aaa model
aaa model: old model
```

Related Topics

- **show aaa model** command

Monitoring IP Addresses of Primary and Secondary DNS and WINS Name Servers

Purpose Display the IP addresses of the primary and secondary DNS and WINS name servers.

Action To display the IP addresses of the primary and secondary DNS and WINS name servers:

```
host1#show aaa name-servers
Name Server Addresses (for PPP Clients):
 primary DNS Addr                    10.2.3.4
 secondary DNS Addr                  10.6.7.8
 primary NBNS (WINS) Addr            10.22.33.44
 secondary NBNS (WINS) Addr          10.66.77.88
```

Meaning The IP addresses of DNS and WINS name servers are displayed.

Related Topics

- **show aaa name-servers** command

Monitoring AAA Profile Configuration

Purpose Display the configuration of all AAA profiles or of a specific profile.

Action To display the configuration of all AAA profiles or of a specific profile:

```
host1#show aaa profile name PreAuth1
preAuth1:
    atm nas-port-type: ADLSL-CAP
    ethernet nas-port-type: Cable
    profile-service-description: xyzService
    pre-authenticate
    allow xyz.com
    deny default
    translate xyz1.com abc.com
```

Meaning Table 14 Lists the **show aaa profile** command output fields.

Table 14: show aaa profile Output Fields

Field Name	Field Description
atm nas-port-type	Configuration of NAS-Port-Type attribute for ATM interfaces
ethernet nas-port-type	Configuration of NAS-Port-Type attribute for Ethernet interfaces
profile-service-description	Description configured in the Service-Description attribute
pre-authenticate	Indicates that subscriber preauthentication is configured for the profile
allow	One or more domain names that are allowed access to AAA authentication
deny	One or more domain names that are denied access to AAA authentication
translate	Original domain name and the name to which it is mapped for domain map lookup

Related Topics

- **show aaa profile** command

Monitoring Statistics about the RADIUS Route-Download Server

Purpose

- Display statistics about the RADIUS route-download server configuration. Use the optional **statistics** keyword to display information about the RADIUS route download server operation.
- Use the optional **delta** keyword to show baselined statistics.

Action To display statistics about the RADIUS route-download server configuration:

```
host1#show aaa route-download
AAA Route Downloader:     configured in virtual router default
Download Interval:        720 minutes
Retry Interval:           10 minutes
Default Cost:             2
Default Tag:              0
Base User Name:           <HOSTNAME>
Password:                 <DEFAULT>
Synchronization:          <NOT SET>

Status:                   idle
Last Download Attempt:    TUE DEC 19 22:46:47 2006
Last Download Success:    TUE DEC 19 22:46:47 2006
Last Regular Download:    complete
Next Download Scheduled:  WED DEC 20 10:46:47 2006
Next Regular Download:    WED DEC 20 10:46:47 2006
```

To display information about the RADIUS route download server operation:

```
host1#show aaa route-download statistics

Total Download Attempts: 2
Successful Downloads:    2
Downloaded Fragments:    3756
Downloaded Routes:       192000
IP Updates:              1
Updated Routes:          96000
Cleared Route Intervals: 0
```

Meaning Table 15 lists the **show aaa route-download** command output fields.

Table 15: show aaa route-download Output Fields

Field Name	Field Description
AAA Route Downloader	Virtual router where the RADIUS route-download server is configured
Download Interval	Number of minutes between route downloads
Retry Interval	Number of minutes before retry after a download failure
Default Cost	Default cost of downloaded routes
Default Tag	Default tag for downloaded routes
Base User Name	Virtual router used for route-download requests; either <HOSTNAME> or the configured name
Password	Password for route-download requests or <DEFAULT>
Synchronization	Either <NOT SET> or the time that the server starts the route download operation each day
Status	Current status of route-download server; waiting for base router, waiting for IP warmstart, idle, downloading, updating ip, downloading and updating ip, or suspended
Last Download Attempt	Either <NEVER> or the day, date, and time of attempt

Table 15: show aaa route-download Output Fields (continued)

Field Name	Field Description
Last Download Success	Either <NEVER> or the day, date, and time of success
Last Regular Download	Status of last regular download; either complete or not complete
Next Download Scheduled	<DOWNLOAD ACTIVE>, <NOT SCHEDULED>, or the day, date, and time of next download
Next Regular Download	Day, date, and time
Total Download Attempts	Number of downloads attempted
Successful Downloads	Number of successful download operations
Downloaded Fragments	Number of downloaded fragments
Downloaded Routes	Number of downloaded routes
IP Updates	Number of IP updates
Updated Routes	Number of updated routes
Cleared Route Intervals	Number of cleared route intervals

Related Topics

- **show aaa route-download** command

Monitoring Routes Downloaded by the RADIUS Route-Download Server

Purpose Display information about the routes that are downloaded by the RADIUS route-download server. Use the optional **detail** keyword to display more detailed information about the downloaded routes.

Action To display information about the routes that are downloaded by the RADIUS route-download server:

```
host1#show aaa route-download routes
96000 downloaded routes
```

To display detailed information about the routes that are downloaded by the RADIUS route-download server:

```
host1#show aaa route-download routes detail
Prefix/Length      Type        NextHop      Dst/Met  Intf   Tag
---------------  --------  ---------------  -------  -----  ---
192.168.1.1/32   Access-P  255.255.255.255  254/2    null0  0
192.168.1.5/32   Access-P  255.255.255.255  254/2    null0  0
192.168.1.9/32   Access-P  255.255.255.255  254/2    null0  0
192.168.1.13/32  Access-P  255.255.255.255  254/2    null0  0
192.168.1.17/32  Access-P  255.255.255.255  254/2    null0  0
192.168.1.21/32  Access-P  255.255.255.255  254/2    null0  0
```

Meaning Table 16 lists the **show aaa route-download routes** command output fields.

Table 16: show aaa route-download routes Output Fields

Field Name	Field Description
downloaded routes	Number of current downloaded routes
Prefix/Length	IP address prefix and mask information for downloaded routes
Type	Type of downloaded routes; Access-P indicates routes downloaded from the RADIUS route-download server
NextHop	IP address of the next hop
Dst/Met	Administrative distance and number of hops for the route
Tag	Tag assigned to downloaded routes
Intf	Interface type and specifier

Related Topics

- **show aaa route-download routes** command

Monitoring Chassis-Wide Routes Downloaded by RADIUS Route-Download Servers

Purpose Display chassis-wide information about routes that are downloaded by RADIUS route-download servers.

Use the optional **detail** keyword to display more detailed information about the downloaded routes.

Use the optional **start** keyword to specify the first router context that you want to display in the output. For example, aaa:a2 specifies that the display shows a list of router contexts starting with VRF a2 in virtual router aaa.

Action To display chassis-wide information about routes that are downloaded by RADIUS route-download servers:

```
host1#show aaa route-download routes global
                                                Number
                                                  of
Virtual Router        VRF       Present Routes
--------------- --------------- ------- ------
aaa                             n       4
aaa             a1              n       4
default                         y       4
default         d1              n       4
```

To display more detailed information about the downloaded routes:

```
host1#show aaa route-download routes global detail
Virtual Router   VRF  Present  Prefix/Length      Type       NextHop       Dst/Met  Intf   Tag
---------------  ---  -------  ---------------  --------  ---------------  -------  -----  ---
aaa                   n        192.168.1.1/32   Access-P  255.255.255.255  0/2      null0  0
aaa                   n        192.168.1.2/32   Access-P  255.255.255.255  0/2      null0  0
aaa                   n        192.168.3.1/32   Access-P  255.255.255.255  0/2      null0  0
```

```
aaa                 n       192.168.4.1/32   Access-P  255.255.255.255  0/2      null0  0
aaa             a1  n       192.168.5.3/32   Access-P  255.255.255.255  0/2      null0  0
aaa             a1  n       192.168.7.1/32   Access-P  255.255.255.255  0/2      null0  0
aaa             a1  n       192.168.7.5/32   Access-P  255.255.255.255  0/2      null0  0
aaa             a1  n       192.168.9.1/32   Access-P  255.255.255.255  0/2      null0  0
default             y       192.168.22.1/32  Access-P  255.255.255.255  0/2      null0  0
default             y       192.168.23.1/32  Access-P  255.255.255.255  0/2      null0  0
default             y       192.168.24.1/32  Access-P  255.255.255.255  0/2      null0  0
default             y       192.168.25.1/32  Access-P  255.255.255.255  0/2      null0  0
default         d1  n       192.168.40.6/32  Access-P  255.255.255.255  0/2      null0  0
default         d1  n       192.168.40.7/32  Access-P  255.255.255.255  0/2      null0  0
default         d1  n       192.168.40.8/32  Access-P  255.255.255.255  0/2      null0  0
default         d1  n       192.168.40.9/32  Access-P  255.255.255.255  0/2      null0  0
```

To specify the first router context that you want to display in the output:

```
host1#show aaa route-download routes global start aaa:a2
                                              Number
                                                of
Virtual Router        VRF       Present Routes
--------------- --------------- ------- ------
default                         y       4
default         d1              n       4
```

Meaning Table 17 lists the **show aaa route-download routes global** command output fields.

Table 17: show aaa route-download routes global Output Fields

Field Name	Field Description
Virtual Router	Name of the virtual router used to download the routes
VRF	Name of the VRF used to download the routes
Present	Routes have been downloaded; y (yes) or n (no) indicates if the router context has been created.
Number of Routes	Number of current downloaded routes
Prefix/Length	IP address prefix and mask information for downloaded routes
Type	Type of downloaded routes; Access-P indicates routes downloaded from the RADIUS route-download server
NextHop	IP address of the next hop
Dst/Met	Administrative distance and number of hops for the route
Tag	Tag assigned to downloaded routes
Intf	Interface type and specifier

Related Topics

- **show aaa route-download routes global** command

Monitoring Authentication, Authorization, and Accounting Statistics

Purpose Display authentication, authorization, and accounting statistics.

Use the optional **delta** keyword to specify that baselined statistics are to be shown.

Action To display authentication, authorization, and accounting statistics:

```
host1#show aaa statistics

              AAA Statistics
              --------------
            Statistic                 Count
-----------------------------------   -----
incoming initiate requests            109
incoming disconnect requests          7
outgoing grant (tunnel) responses     3
outgoing grant responses              6
outgoing deny responses               0
outgoing error responses              0
outgoing Authentication requests      9
incoming Authentication responses     9
outgoing Re-Authentication requests   0
incoming Re-Authentication responses  0
outgoing Pre-Authentication requests  1
incoming Pre-Authentication responses 1
outgoing Accounting requests          120
incoming Accounting responses         120
outgoing Duplicate Acct requests      18
incoming Duplicate Acct responses     18
outgoing Broadcast Acct requests      32
incoming Broadcast Acct responses     32
outgoing Address requests             0
incoming Address responses            0
```

Meaning Table 18 lists the **show aaa statistics** command output fields.

Table 18: show aaa statistics Output Fields

Field Name	Field Description
incoming initiate requests	Number of incoming AAA requests (from other E-series applications) for user connect services
incoming disconnect requests	Number of incoming AAA requests (from other E-series applications) for user disconnect services
outgoing grant (tunnel) responses	Number of outgoing tunnel grant responses to AAA requests
outgoing grant responses	Number of outgoing grant responses to AAA requests
outgoing deny responses	Number of outgoing deny responses to AAA requests
outgoing error responses	Number of outgoing error responses to AAA requests
outgoing Authentication requests	Number of authentication requests from AAA to the authentication task
incoming Authentication responses	Number of authentication responses from the authentication task to AAA
outgoing Re-Authentication requests	Number of reauthentication requests from AAA to the authentication task

Table 18: show aaa statistics Output Fields (continued)

Field Name	Field Description
incoming Re-Authentication responses	Number of reauthentication responses from the authentication task to AAA
outgoing Pre-Authentication requests	Number of preauthentication requests from AAA to the preauthentication task
incoming Pre-Authentication responses	Number of preauthentication responses from the preauthentication task to AAA
outgoing Accounting requests	Number of accounting requests (starts, updates, stops) from AAA to the accounting task
incoming Accounting responses	Number of accounting responses (starts, updates, stops) from the accounting task to AAA
outgoing Duplicate Acct requests	Number of duplicate accounting requests (starts, updates, stops) from AAA to the accounting task
incoming Duplicate Acct responses	Number of duplicate accounting responses (starts, updates, stops) from the accounting task to AAA
outgoing Broadcast Acct requests	Number of broadcast accounting requests (starts, updates, stops) from AAA to the accounting task
incoming Broadcast Acct responses	Number of broadcast accounting responses (starts, updates, stops) from the accounting task to AAA
outgoing Address requests	Number of address allocation/release requests from AAA to address allocation task
incoming Address responses	Number of address allocation/release responses from the address allocation task to AAA

Related Topics

- **show aaa statistics** command

Monitoring the Number of Active Subscribers Per Port

Purpose Display the maximum number of active subscribers configured per port.

Action To display the maximum number of active subscribers configured per port:

```
host1#show aaa subscriber per-port-limit
     Subscriber Port Limits
     ----------------------
     Port              Limit
---------------   ---------------
0/2               5
0/3               2
3/2               2
```

Related Topics

- **show aaa subscriber per-port-limit** command

Monitoring the Maximum Number of Active Subscribers Per Virtual Router

Purpose Display the maximum number of active subscribers configured per virtual router.

Action To display the maximum number of active subscribers configured per virtual router:

```
host1#show aaa subscriber per-vr-limit
subscriber limit is 0
```

Related Topics

- **show aaa subscriber per-vr-limit** command

Monitoring Session Timeouts

Purpose Display idle and session timeouts.

Action To display idle and session timeouts:

```
host1#show aaa timeout
idle timeout (for PPP Clients) 0 seconds
session timeout (for PPP Clients) 31622400 seconds
```

Related Topics

- **show aaa timeout** command

Monitoring Interim Accounting for Users on the Virtual Router

Purpose Display the default interval used for interim accounting for users on the virtual router. An entry of 0 indicates that the feature is disabled.

Action To display the default interval used for interim accounting for users on the virtual router:

```
host1:vrXyz7#show aaa user accounting interval
user-acct-interval 20
```

Related Topics

- **show aaa user accounting interval** command

Monitoring VIrtual Router Groups Configured for AAA Broadcast Accounting

Purpose Display the virtual router groups that are configured for AAA broadcast accounting.

For additional information about the **show configuration** command, see *Customizing the Configuration Output* in *JUNOSe System Basics Configuration Guide, Chapter 5, Managing the System*.

Action To display the virtual router groups that are configured for AAA broadcast accounting:

```
host1#show configuration category aaa global-attributes
! Configuration script being generated on MON JAN 10 2005 15:19:19 UTC
! Juniper Edge Routing Switch ERX-1440
! Version: 9.9.9 development-4.0 (January 7, 2005  17:26)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system
configuration.
! The category displayed is: aaa global-attributes
!
aaa accounting vr-group groupXyzCompany10
 aaa virtual-router 1 vrXyzA
 aaa virtual-router 2 vrXyzB
 aaa virtual-router 3 vrXyzC
 aaa virtual-router 4 vrXyzD

aaa accounting vr-group groupXyzCompany20
 aaa virtual-router 1 vrXyzP
 aaa virtual-router 2 vrXyzQ
 aaa virtual-router 3 vrXyzR
 aaa virtual-router 4 vrXyzS
!
hostname "host1"
```

Meaning Table 19 lists the **show configuration category aaa global-attributes** command output fields.

Table 19: show configuration category aaa global-attributes Output Fields

Field Name	Field Description
aaa accounting vr-group	Name of virtual router groups
aaa virtual-router	Name and index number of the virtual routers that are members of the virtual router group

Related Topics

- **show configuration category aaa global-attributes** command

Monitoring Configuration Information for AAA Local Authentication

Purpose Display the configuration information for AAA local authentication. You can display information for the following keywords:

- **databases**—Local user databases configured on the router
- **users**—Users configured in the local user databases
- **virtual-router**—Local user database selected by the specified virtual router for local authentication

- For additional information about the **show configuration** command, see *Customizing the Configuration Output* in *JUNOSe System Basics Configuration Guide, Chapter 5, Managing the System*.

Action To display the configuration information for AAA local authentication:

```
host1#show configuration category aaa local-authentication databases
! Configuration script being generated on TUE NOV 09 2004 12:50:18 UTC
! Juniper Edge Routing Switch ERX-1400
! Version: 6.1.0 (November 8, 2004  18:31)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system
configuration.
! The category displayed is: aaa local-authentication databases
!
hostname host1
aaa new-model
aaa local database default
aaa local database svaleLdb10
```

Meaning Table 20 lists the **show configuration category aaa local-authentication** command output fields.

Table 20: show configuration category aaa global-attributes Output Fields

Field Name	Field Description
aaa local database	Name of the local user database; the name **default** specifies the default local user database
aaa local select database	Local user database that the virtual router uses for local authentication
aaa local username	Unique user entry in the local user database
database	Name of the local user database for the specified username
hostname	Name of the host router
ip-address	IP address parameter for the user entry
ip-address-pool	IP address pool parameter for the user entry
operational virtual-router	Virtual router parameter for the user entry
password	Password used to authenticate the subscriber
secret	Secret used to authenticate the subscriber
virtual-router	Name of virtual router

Related Topics

- **show configuration category aaa local-authentication** command

Monitoring AAA Server Attributes

Purpose Display status of the attributes on the AAA server, including AAA accounting duplication and broadcast.

For additional information about the **show configuration** command, see *Customizing the Configuration Output* in *JUNOSe System Basics Configuration Guide, Chapter 5, Managing the System*.

Action To display status of the attributes on the AAA server, including AAA accounting duplication and broadcast:

```
host1#show configuration category aaa server-attributes include-defaults
! Configuration script being generated on MON JAN 10 2005 15:12:02 UTC
! Juniper Edge Routing Switch ERX-1440
! Version: 9.9.9 development-4.0 (January 7, 2005  17:26)
! Copyright (c) 1999-2004 Juniper Networks, Inc.  All rights reserved.
!
! Commands displayed are limited to those available at privilege level 15
!
! NOTE:  This script represents only a subset of the full system configuration.
! The category displayed is: aaa server-attributes
!
virtual-router default
aaa accounting duplication lac
aaa accounting broadcast group1
aaa duplicate-address-check enable
aaa accounting acct-stop on-aaa-failure enable
aaa accounting acct-stop on-access-deny disable
aaa subscriber limit per-vr 0
aaa intf-desc-format include sub-intf enable
aaa intf-desc-format include adapter enable
aaa accounting immediate-update disable
!
! ================================================================================
!
virtual-router lac
no aaa accounting duplication
no aaa accounting broadcast
aaa duplicate-address-check enable
aaa accounting acct-stop on-aaa-failure enable
aaa accounting acct-stop on-access-deny disable
aaa subscriber limit per-vr 0
aaa intf-desc-format include sub-intf enable
aaa intf-desc-format include adapter enable
aaa accounting immediate-update disable
!
! ================================================================================
!
virtual-router isp
no aaa accounting duplication
no aaa accounting broadcast
aaa duplicate-address-check enable
aaa accounting acct-stop on-aaa-failure enable
aaa accounting acct-stop on-access-deny disable
aaa subscriber limit per-vr 0
aaa intf-desc-format include sub-intf enable
aaa intf-desc-format include adapter enable
aaa accounting immediate-update disable
```

Meaning Table 21 lists the **show configuration category aaa server-attributes include-defaults** command output fields.

Table 21: show configuration category aaa server-attributes include-defaults Output Fields

Field Name	Field Description
virtual router	Name of the virtual router
aaa accounting duplication	Virtual router used for duplicate accounting
aaa accounting broadcast	Virtual router group used for broadcast accounting
aaa duplicate-address-check	Enabled, disabled
aaa accounting acct-stop on-aaa-failure	Enabled, disabled
aaa accounting acct-stop on-access-deny	Enabled, disabled
aaa subscriber limit per-vr	Enabled, disabled
aaa intf-desc-format include sub-intf	Enabled, disabled
aaa intf-desc-format include adapter	Enabled, disabled
aaa accounting immediate-update	Enabled, disabled

Related Topics

- **show configuration category aaa server-attributes include-defaults** command

Monitoring the COPS Layer Over SRC Connection

Purpose Display information about the COPS layer over which the SRC connection is made.

Action To display information about the COPS layer over which the SRC connection is made:

```
host1#show cops info
General Cops Information:

        Sessions Created: 1
        Sessions Deleted: 0
        Current Sessions: 1
        Bytes Received: 680
        Packets Received: 17
        Bytes Sent: 692
        Packets Sent: 21
        Keep Alive Received: 12
        Keep Alive Sent: 12

Session Information
        Remote Ip Address: 10.10.0.223
        Remote TCP Port: 4001
        Client Type: 16384
        Bytes Received:   2224
        Packets Received: 5
        Bytes Sent:       596
```

```
Packets Sent:     9
REQ Sent:         4
DEC Rcv:          4
RPT Sent:         4
DRQ Sent:         0
SSQ Rcv:          0
OPN Sent:         1
CAT Rcv:          1
CC Sent:          0
CC Rcv:           0
SSC Sent:         0
```

Meaning Table 22 lists the **show cops info** command output fields.

Table 22: show cops info Output Fields

Field Name	Field Description
Session Created	Number of COPS sessions created
Sessions Deleted	Number of COPS sessions deleted
Current Sessions	Number of current COPS sessions
Bytes Received	Number of bytes received on all COPS sessions
Packets Received	Number of packets received on all COPS sessions
Bytes Sent	Number of bytes transmitted on all COPS sessions
Packets Sent	Number of packets transmitted on all COPS sessions
Keep Alive Received	Number of COPS keepalive messages received
Keep Alive Sent	Number of COPS keepalive message*s sent*
Remote IP Address	IP address of the remote pee
Remote TCP Port	TCP port number of the remote peer
Client Type	Type of client for the session. For this release the client type must be 16640 (SRC client).
Bytes Received	Number of bytes received for this COPS session
Packets Received	Number of packets received for this COPS session
Bytes Sent	Number of bytes sent on this COPS session
Packets Sent	Number of packets sent on this COPS session
REQ Sent	Number of Request packets sent on this COPS session
DEC Rcv	Number of Decision packets received on this COPS session
RPT Sent	Number of Report packets sent on this COPS session
DRQ Sent	Number of Delete Requests sent on this COPS session
SSQ Rcv	Number of Synch Requests received on this COPS session
OPN Sent	Number of Open messages sent on this COPS session
CAT Rcv	Number of Client Accepts packets received on this COPS session

Table 22: show cops info Output Fields (continued)

Field Name	Field Description
CC Sent	Number of Client Closes packets sent on this COPS session
CC Rcv	Number of Client Closes packets received on this COPS session
SSC Sent	Number of Sync Complete packets sent on this COPS session

Related Topics

- **show cops info** command

Monitoring Statistics About the COPS Layer

Purpose Display statistics about the COPS layer over which the SRC connection is made.

Action To display statistics about the COPS layer:

```
host1#show cops statistics
General Cops Information:
        Sessions Created: 0
        Sessions Deleted: 0
        Current Sessions: 0
        Bytes Received: 1108
        Packets Received: 12
        Bytes Sent: 1572
        Packets Sent: 18
        Keep Alive Received: 2
        Keep Alive Sent: 2
Session Information:
        Client Type: 24754
        Bytes Received:   2539032
        Packets Received: 20388
        Bytes Sent:       4386648
        Packets Sent:     51337
        REQ Sent:         21203
        DEC Rcv:          20388
        RPT Sent:         20391
        DRQ Sent:         9743
        SSQ Rcv:          0
        OPN Sent:         0
        CAT Rcv:          0
        CC Sent:          0
        CC Rcv:           0
        SSC Sent:         0
```

Meaning Table 23 lists the **show cops statistics** command output fields.

Table 23: show cops statistics Output Fields

Field Name	Field Description
Session Created	Number of COPS sessions created
Sessions Deleted	Number of COPS sessions deleted
Current Sessions	Number of current COPS sessions
Bytes Received	Number of bytes received on all COPS sessions
Packets Received	Number of packets received on all COPS sessions
Bytes Sent	Number of bytes transmitted on all COPS sessions
Packets Sent	Number of packets transmitted on all COPS sessions
Keep Alive Received	Number of COPS keepalive messages received
Keep Alive Sent	Number of COPS keepalive message*s sent*
Client Type	Type of client for the session
Bytes Received	Number of bytes received for this COPS session
Packets Received	Number of packets received for this COPS session
Bytes Sent	Number of bytes sent on this COPS session
Packets Sent	Number of packets sent on this COPS session
REQ Sent	Number of Request packets sent on this COPS session
DEC Rcv	Number of Decision packets received on this COPS session
RPT Sent	Number of Report packets sent on this COPS session
DRQ Sent	Number of Delete Requests sent on this COPS session
SSQ Rcv	Number of Synch Requests received on this COPS session
OPN Sent	Number of Open messages sent on this COPS session
CAT Rcv	Number of Client Accepts packets received on this COPS session
CC Sent	Number of Client Closes packets sent on this COPS session
CC Rcv	Number of Client Closes packets received on this COPS session
SSC Sent	Number of Sync Complete packets sent on this COPS session

Related Topics

- **show cops statistics** command

Monitoring Local Address Pool Aliases

Purpose Display information about aliases for the local address pools configured on your router. If you do not specify a particular alias, the router displays all aliases.

Action To display information about local address pool aliases:

```
host1#show ip local alias

Alias    Pool
------   -----
alias1   poolA
alias2   poolB
alias3   poolC
 poolA   poolD
 poolB   poolD
 poolC   poolD
```

Meaning Table 24 lists the show **ip local alias** command output fields.

Table 24: show ip local alias Output Fields

Field Name	Field Description
Alias	Name of alias for the local address pool
Pool	Name of the local address pool

Related Topics

- **show ip local alias** command

Monitoring Local Address Pools

Purpose Display information about the local address pools configured on your router. If you do not specify the name of a local address pool, the router displays all local address pools.

Action To display information about local address pools:

```
host1#show ip local pool

         High    Abated
Pool    Thresh   Thresh   Trap   Group
-----   ------   ------   ----   -----
poolA       85       75    N

     Aliases
     -------
      alias1

                                  In
      Begin        End      Free   Use
     --------   ---------   ----   ---
     10.1.1.1   10.1.1.10    10     0
     10.1.2.1   10.1.2.10    10     0
     10.1.3.1   10.1.3.10    10     0
```

```
         High    Abated
Pool    Thresh   Thresh   Trap   Group
-----   ------   ------   ----   -----
poolB       85       75    N

     Aliases
     -------
      alias2
                                  In
      Begin        End       Free   Use
     --------   ---------    ----   ---
     10.2.1.1   10.2.1.10     10     0
     10.2.2.1   10.2.2.10     10     0

         High    Abated
Pool    Thresh   Thresh   Trap   Group
-----   ------   ------   ----   -----
poolC       85       75    N

     Aliases
     -------
      alias3
                                  In
      Begin        End       Free   Use
     --------   ---------    ----   ---
     10.3.1.1   10.3.1.10     10     0

         High    Abated
Pool    Thresh   Thresh   Trap   Group
-----   ------   ------   ----   -----
poolD       85       75    N

     Aliases
     -------
       poolA
       poolB
       poolC
                                  In
      Begin        End       Free   Use
     --------   ----------   ----   ---
     10.4.1.1   10.4.1.255   255     0
```

Meaning Table 25 lists the **show ip local pool** command output fields.

Table 25: show ip local pool Output Fields

Field Name	Field Description
Pool	User-specified name of the address pool
High Thresh	High utilization threshold value
Abated Thresh	Abated utilization threshold value
Trap	Enable SNMP pool utilization traps: Y (yes) or N (no)
Aliases	Aliases for the local address pool
Begin	Starting IP address
End	Ending IP address
Free	Number of addresses available for use
In Use	Number of addresses currently in use

Related Topics

- **show ip local pool** command

Monitoring Local Address Pool Statistics

Purpose Display local address pool statistics. Use the optional **delta** keyword to specify that baselined statistics are to be shown.

Action To display local address pool statistics:

```
host1#show ip local pool statistics
 Local Address Pool Statistics

            Statistic               Values
---------------------------------   ------
Requests denied (pool exhaustion)   0
```

Related Topics

- **show ip local pool statistics** command

Monitoring Shared Local Address Pools

Purpose Display the shared local address pool configurations.

Action To display shared local address pool configuration information:

```
host1#show ip local shared-pool

Shared Pool   In Use  Dhcp Pool
-----------   ------  ---------
shared_poolA  253     dhcp_pool_25
shared_poolB  83      dhcp_pool_25
shared_poolC  99      dhcp_pool_17
```

Meaning Table 26 lists the **show ip local shared-pool** command output fields.

Table 26: show ip local shared-pool Output Fields

Field Name	Field Description
Shared Pool	Name of the shared local address pool
In Use	Number of addresses allocated
Dhcp Pool	Name of the DHCP address pool

Related Topics

- **show ip local shared-pool** command

Monitoring the Routing Table

Purpose Display the current state of the routing table, including routes not used for forwarding. An Access-P entry in the Type column of the output indicates routes that are downloaded by the RADIUS route-download server.

Action To display information in the routing table:

```
host1#show ip route
Protocol/Route type codes:
  I1- ISIS level 1, I2- ISIS level2,
  I- route type intra, IA- route type inter, E- route type external,
  i- metric type internal, e- metric type external,
  P- periodic download, O- OSPF, E1- external type 1, E2- external type2,
  N1- NSSA external type1, N2- NSSA external type2
  L- MPLS label, V- VRF, *- via indirect next-hop

Prefix/Length      Type       Next Hop      Dst/Met          Interface
------------------ --------- --------------- ---------- -----------------
0.0.0.0/0          Static    10.13.10.1      1/0        FastEthernet6/0/0
192.168.10.0/23    Connect   10.13.10.187    0/0        FastEthernet6/0/0
192.168.21.21/32   Access-P  255.255.255.255 254/2      null0
192.168.22.22/32   Access-P  255.255.255.255 254/2      null0
192.168.23.23/32   Access-P  255.255.255.255 254/2      null0
192.168.24.24/32   Access-P  255.255.255.255 254/2      null0
```

Meaning Refer to the description of the **show ip route** command in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP* for additional information about the **show ip route** command.

Related Topics

- **show ip route** command

Monitoring the B-RAS License

Purpose Display the B-RAS license.

Action To display the B-RAS license:

```
host1#show license b-ras
K4bZ16Lr
```

Related Topics

- **show license b-ras** command

Monitoring the RADIUS Server Algorithm

Purpose Display information about the currently configured RADIUS server algorithm.

Action To display the RADIUS server algorithm:

```
host1#show radius algorithm
direct
```

Related Topics

- **show radius algorithm** command

Monitoring RADIUS Override Settings

Purpose Display the current RADIUS override settings.

Action To display the RADIUS override settings:

```
host1:vrXyz7#show radius override
nas-ip-addr: nas-ip-addr
nas-info:    from authentication virtual router
```

Meaning Table 27 lists the **show radius override** command output fields.

Table 27: show radius override Output Fields

Field Name	Field Description
nas-ip-addr	Either the NAS-IP-Address [4] attribute is used, or it is overridden with the Tunnel-Client-Endpoint [66] attribute.
nas-info	Either the NAS-IP-Address [4] and NAS-Identifier [32] attributes of the virtual router generating the accounting information are used, or they are overridden with the respective attributes of the authentication virtual router.

Related Topics

- **show radius override** command

Monitoring the RADIUS Rollover Configuration

Purpose Display the configuration of the RADIUS rollover-on-reject feature.

Action To display the RADIUS rollover configuration:

```
host1#show radius rollover-on-reject
rollover-on-reject enabled
```

Meaning RADIUS rollover-on-reject is enabled.

Related Topics

- **show radius rollover-on-reject** command

Monitoring RADIUS Server Information

Purpose Display RADIUS server information.

Use with the optional **accounting**, **authentication**, **dynamic-request**, **route-download**, or **pre-authentication** keywords to limit output to the specific type of server.

Action To display RADIUS server configuration information:

```
host1#show radius servers
               RADIUS Authentication Configuration
               -----------------------------------
                Udp    Retry             Maximum    Dead
 IP Address     Port   Count   Timeout   Sessions   Time   Secret
-------------   ----   -----   -------   --------   ----   ------
172.28.30.117   1812   3       3         255        0      radius

                RADIUS Accounting Configuration
                -------------------------------
                Udp    Retry             Maximum    Dead
 IP Address     Port   Count   Timeout   Sessions   Time   Secret
-------------   ----   -----   -------   --------   ----   ------
172.28.30.117   1813   3       3         255        0      radius


               RADIUS Pre-Authentication Configuration
               ---------------------------------------
                Udp    Retry             Maximum    Dead
 IP Address     Port   Count   Timeout   Sessions   Time   Secret
-------------   ----   -----   -------   --------   ----   ------
172.28.30.117   1812   3       3         255        0      radius


               RADIUS Route-Download Configuration
               -----------------------------------
                Udp    Retry             Maximum    Dead
 IP Address     Port   Count   Timeout   Sessions   Time   Secret
-------------   ----   -----   -------   --------   ----   ------
192.168.30.16   1812   3       3         255        0      radius
```

Meaning Table 28 lists the **show radius servers** command output fields.

Table 28: show radius servers Output Fields

Field Name	Field Description
IP Address	IP address of RADIUS server
Udp Port	Number of the UDP port of the RADIUS server
Retry Count	Maximum number of times that the router retransmits a RADIUS packet to the RADIUS server
Timeout	Interval (in seconds) before the router retransmits a RADIUS packet to the RADIUS server

Table 28: show radius servers Output Fields (continued)

Field Name	Field Description
Maximum Sessions	Number of outstanding requests to the RADIUS server
Dead Time	Amount of time to remove the authentication server or accounting server from the available list when a timeout occurs
Secret	Configured authentication server or accounting server secret

Related Topics

- **show radius servers** command

Monitoring RADIUS Services Statistics

Purpose Use to display statistics for RADIUS services.

Use with the optional **accounting**, **authentication**, **dynamic-request**, **route-download**, or **pre-authentication** keywords to limit output to the specific type of statistics. Use the optional **delta** keyword to specify that baselined statistics are to be shown.

Action To display RADIUS authentication and accounting statistics:

```
host1#show radius statistics
   RADIUS Authentication Statistics
   --------------------------------
     Statistic        10.10.121.128
-------------------   -------------
UDP Port              1812
Round Trip Time       0
Access Requests       0
Rollover Requests     0
Retransmissions       0
Access Accepts        0
Access Rejects        0
Access Challenges     0
Malformed Responses   0
Bad Authenticators    0
Requests Pending      0
Request Timeouts      0
Unknown Responses     0
Packets Dropped       0

     RADIUS Accounting Statistics
     ----------------------------
     Statistic        10.10.121.128
-------------------   -------------
UDP Port              1646
Round Trip Time       2
Requests              1
Start Requests        1
Interim Requests      0
Stop Requests         0
Reject Requests       0
Rollover Requests     0
```

```
Retransmissions       3
Responses             1
Start Responses       1
Interim Responses     0
Stop Responses        0
Reject Responses      0
Malformed Responses   0
Bad Authenticators    0
Requests Pending      0
Request Timeouts      3
Unknown Responses     0
Packets Dropped       0
```

To display RADIUS pre-authentication statistics:

```
host1#show radius pre-authentication statistics

 RADIUS Pre-Authentication Statistics
 ------------------------------------
     Statistic        172.28.30.117
-------------------   -------------
UDP Port              1812
Round Trip Time       0
Access Requests       2809
Rollover Requests     0
Retransmissions       56
Access Accepts        2809
Access Rejects        0
Access Challenges     0
Malformed Responses   0
Bad Authenticators    0
Requests Pending      0
Request Timeouts      72
Unknown Responses     0
Packets Dropped       2
```

To display RADIUS route-download statistics:

```
host1#show radius route-download statistics

 RADIUS Route-Download Statistics
 --------------------------------
     Statistic        192.168.30.16
-------------------   -------------
UDP Port              1812
Round Trip Time       0
Access Requests       1613
Rollover Requests     0
Retransmissions       6
Access Accepts        1612
Access Rejects        1
Access Challenges     0
Malformed Responses   0
Bad Authenticators    0
Requests Pending      0
Request Timeouts      6
Unknown Responses     0
Packets Dropped       5
```

Meaning Table 29 lists the **show radius statistics** command output fields.

NOTE: All descriptions apply to the primary, secondary, and tertiary RADIUS authentication and accounting servers.

Table 29: show radius statistics Output Fields

Field Name	Field Description
UDP Port	Number of the UDP port of a RADIUS server
Round Trip Time	Hundreds of seconds from request to response
Access Requests	Number of access requests sent to server
Rollover Requests	Number of requests coming into server as a result of the previous server timing out
Retransmissions	Number of retransmissions
Access Accepts	Number of Access-Accepts received from the server
Access Rejects	Number of Access-Rejects received from the server
Access Challenges	Number of access challenges received from the server
Malformed Responses	Number of responses with attributes having an invalid length or unexpected attributes (such as two attributes when the response is required to have at most one)
Bad Authenticators	Number of responses in which the authenticator is incorrect for the matching request. This can occur if the RADIUS secret for the client and server does not match.
Requests Pending	Number of requests waiting for a response
Request Timeouts	Number of requests that timed out
Unknown Responses	Number of unknown responses. The RADIUS response type in the header is invalid or unsupported.
Packets Dropped	Number of packets dropped either because they are too short or the E-series router receives a response for which there is no corresponding request. For example, if the router sends a request and the request times out, the router removes the request from the list and sends a new request. If the server is slow and sends a response to the first request after the router removes the request, the packet is dropped.
Requests	Total number of accounting requests sent, which is the combined total of Start Requests, Interim Requests, Stop Requests, and Reject Requests
Start Requests	Number of accounting start requests sent; includes Acct-On, Acct-Start, Acct-Link-State, and Acct-Tunnel-Start requests
Interim Requests	Number of interim accounting requests
Stop Requests	Number of accounting stop requests sent; includes Acct-Off, Acct-Stop, Acct-Link-Stop, and Acct-Tunnel-Stop requests

Table 29: show radius statistics Output Fields (continued)

Field Name	Field Description
Reject Requests	Number of accounting reject requests sent; includes Acct-Link-Reject and Acct-Tunnel-Reject requests
Responses	Number of accounting responses received from the server
Start Responses	Number of accounting start responses received; includes Acct-On, Acct-Start, Acct-Link-Start, and Acct-Tunnel-Start responses
Interim Responses	Number of interim accounting responses
Stop Responses	Number of accounting stop responses received; includes Acct-Off, Acct-Stop, Acct-Link-Stop, and Acct-Tunnel-Stop responses
Reject Responses	Number of accounting reject responses received; includes Acct-Link-Reject and Acct-Tunnel-Reject responses

Related Topics

- **show radius statistics** command

Monitoring RADIUS SNMP Traps

Purpose Display the configuration of RADIUS SNMP traps.

Action To display RADIUS SNMP traps configuration information:

```
host1#show radius trap
trap for auth-server-not-responding enabled
trap for no-auth-server-responding disabled
trap for auth-server-responding enabled
trap for acct-server-not-responding enabled
trap for no-acct-server-responding disabled
trap for acct-server-responding disabled
```

Meaning A list of the configured RADIUS-related SNMP traps is displayed.

Related Topics

- **show radius trap** command

Monitoring RADIUS Accounting for L2TP Tunnels

Purpose Display the status for RADIUS accounting for L2TP tunnels.

Action To display RADIUS accounting for L2TP tunnels:

```
host1#show radius tunnel-accounting
disabled
```

Meaning RADIUS accounting is either enabled or disabled.

Related Topics

- **show radius tunnel-accounting** command

Monitoring RADIUS UDP Checksums

Purpose Display information about UDP checksums.

Action To display the status of RADIUS UDP checksums:

```
host1#show radius udp-checksum
enabled
```

Meaning RADIUS checksums status is either enabled or disabled.

Related Topics

- **show radius udp-checksum** command

Monitoring RADIUS Server IP Addresses

Purpose Display the IP address of the RADIUS servers.

Action To display the RADIUS server IP address:

```
host1#show radius update-source-address
192.168.1.228
```

Related Topics

- **show radius update-source-addr** command

Monitoring SRC Client Connection Status

Purpose Display the current status of the SRC client connection to the SAEs. The command output refers to the SRC client by its former name, SSC client.

Action To display the status of the SRC client connection:

```
host1#show sscc info
The SSC Client is currently unconnected
The SSC Client configured servers are:
        Primary: 10.10.2.2:3
        Secondary: 0.0.0.0:0
        Tertiary: 0.0.0.0:0
        Local Source: FastEthernet 0/0, Local Source Address: 10.13.5.61
        The configured transport router is: default
```

```
        The configured retry timer is (seconds): 90
        The connection state is: NoConnection
SSC Client Statistics:
        Policy Commands received   0
        Policy Commands(List)      0
        Policy Commands(Acct)      0
        Bad Policy Cmds received   0
        Error Policy Cmds received 0
        Policy Reports sent        0
        Connection Open requests   0
        Connection Open completed  0
        Connection Closed sent     0
        Connection Closed remotely 0
        Create Interfaces sent     0
        Delete Interfaces sent     0
        Active IP Interfaces       2
        IP Interface Transitions   0
        Synchronizes received      0
        Synchronize Complete sent  0
        Internal Errors            0
        Communication Errors       0
        Tokens Seen                0
        Active Tokens              0
        Token Transitions          0
        Token Creates Sent         0
        Token Deletes Sent         0
        Active Addresses           0
        Address Transitions        0
        Create Addresses Sent      0
        Delete Addresses Sent      0
        Authentication Successes   0
        Authentication Failures    0
```

Meaning Table 30 lists the **show sscc info** command output fields.

Table 30: show sscc info Output Fields

Field Name	Field Description
The SSC client configured servers	IP addresses of the primary, secondary, and tertiary SAEs
Local Source	Fixed source interface for the TCP/COPS connection
Local Source Address	Fixed source address for the TCP/COPS connection
The configured transport router is	Router on which is TCP/COPS connection is established
The configured retry timer is (seconds)	Delay period the client waits for a response from the SAE before submitting request again
The connection state is	Current state of the TCP/COPS connection

Table 30: show sscc info Output Fields (continued)

Field Name	Field Description
SSC Client Statistics	Statistics about the connection between the SRC client and SAE ■ Policy Commands received—Number of policy commands received on the SRC client connection ■ Policy Commands(List)—Number of Policy Commands with subtype List ■ Policy Commands(Acct)—Number of Policy Commands with subtype Accounting ■ Bad Policy Cmds received—Number of Policy Commands received with bad policies ■ Error Policy Cmds received—Number of Policy Commands received with errors ■ Policy Reports sent—Number of Policy Reports sent ■ Connection Open requests—Number of connections the SRC client has tried to open with a remote SAE ■ Connection Open completed—Number of connections successfully open to the SAE ■ Connection Closed sent—Number of connections the SRC client has closed ■ Connection Closed remotely—Number of connections that were closed by the remote SAE ■ Create Interfaces sent—Number of create interface indications sent to the SAE ■ Delete Interfaces sent—Number of delete interface indications sent to the SAE ■ Active IP Interfaces—Current number of active IP interfaces the SRC client is aware of ■ IP Interface Transitions—Number of IP interface transitions logged by the SRC client ■ Synchronizes received—Number of synchronization requests the SRC client received from the SAE ■ Synchronize Complete sent—Number of synchronization complete indications sent ■ Internal Errors—Number of internal errors ■ Communication Errors—Number of errors with lower-layer communications (such as socket errors)

Related Topics

■ **show sscc info** command

Monitoring SRC Client Connection Statistics

Purpose Display statistics about connection between the SRC client and SAE. The command output refers to the SRC client by its former name, SSC client.

Action To display statistics for the SRC client connection:

```
host1#show sscc statistics
SSC Client Statistics:
        Policy Commands received   0
        Policy Commands(List)      0
        Policy Commands(Acct)      0
        Bad Policy Cmds received   0
        Error Policy Cmds received 0
        Policy Reports sent        3
        Connection attempts        7
        Connection Open requests   7
        Connection Open completed  0
        Connection Closed sent     0
        Connection Closed remotely 5
        Create Interfaces sent     0
        Delete Interfaces sent     3
        Active IP Interfaces       3282
        IP Interface Transitions   3281
        Synchronizes received      0
        Synchronizes rcvd & droped 0
        Synchronize Complete sent  2
        Internal Errors            0
        Communication Errors       0
        Discovers Seen             15263
        Active Discovers           4911
        Discover Transitions       20704
        Discover Creates Sent      15263
        Discover Deletes Sent      10352
        Active Addresses           3274
        Address Transitions        3280
        Create Addresses Sent      3277
        Delete Addresses Sent      3
```

Meaning Table 31 lists the **show sscc statistics** command output fields.

Table 31: show sscc statistics Output Fields

Field Name	Field Description
Policy Commands received	Number of policy commands received on the SRC client connection
Policy Commands(List)	Number of Policy Commands with subtype List
Policy Commands(Acct)	Number of Policy Commands with subtype Accounting
Bad Policy Cmds received	Number of Policy Commands received with bad policies
Error Policy Cmds received	Number of Policy Commands received with errors
Policy Reports sent	Number of Policy Reports sent
Connection Open requests	Number of connections the SRC client has tried to open with a remote SAE
Connection Open completed	Number of connections successfully open to the SAE

Table 31: show sscc statistics Output Fields (continued)

Field Name	Field Description
Connection Closed sent	Number of connections the SRC client has closed
Connection Closed remotely	Number of connections that were closed by the remote SAE
Create Interfaces sent	Number of create interface indications sent to the SAE
Delete Interfaces sent	Number of delete interface indications sent to the SAE
Active IP Interfaces	Current number of active IP interfaces the SRC client is aware of
IP Interface Transitions	Number of IP interface transitions logged by the SRC client
Synchronizes received	Number of synchronization requests the SRC client received from the SAE
Synchronize Complete sent	Number of synchronization complete indications sent
Internal Errors	Number of internal errors
Communication Errors	Number of errors with lower-layer communications (such as socket errors)

Related Topics

- **show sscc statistics** command

Monitoring the SRC Client Version Number

Purpose Display the SRC client (formerly SDX client) version number.

Action To display the SRC client version number:

```
host1#show sscc version
The SSC Client version is: 4.0
```

Related Topics

- **show sscc version** command

Monitoring Subscriber Information

Purpose Display the active subscribers on the router. If you specify a username, the router displays only the users that match. When you issue the command in the default VR, all users are displayed. When you issue the command in a nondefault VR, only those users attached to that VR are displayed. The following list describes keywords that you can use with the **show subscribers** command:

- You can use the **domain**, **interface**, **port**, **slot**, **username**, or **virtual-router** keywords on all routers to filter the results. If you do not use a keyword, all active users are displayed.
- When you use the **interface** keyword to display detailed subscriber information by interface, you must also specify either the **atm** or **ethernet** keyword, an interface specifier, and optionally a subinterface specifier.
- The output displayed in the interface field depends on the configuration of two commands at the time the subscriber logs in: **aaa intf-desc-format include sub-intf** and **aaa intf-desc-format include adapter** (for the E120 and E320 routers).
  - When the **aaa intf-desc-format include sub-intf disable** command has been issued, the subinterface is stripped from the subscriber's interface field at login and is not displayed in the output. In the default state, or when the **aaa intf-desc-format include sub-intf enable** command has been issued, the subinterface is included in the subscriber's interface field at login, and is displayed in the output.
  - When the **aaa intf-desc-format include adapter disable** command has been issued, the adapter is stripped from the subscriber's interface field at login and is not displayed in the output. In the default state, or when the **aaa intf-desc-format include adapter enable** command has been issued, the adapter is included in the subscriber's interface field at login and is displayed in the output.
  - Even when the subinterface has been stripped from the subscriber's interface field, you can still include the subinterface specifier in the **show subscribers interface** command. Even though the subinterface itself is not displayed, only subscribers on the specified subinterface are displayed.
  - These considerations do not apply when you issue the **summary** keyword. The output displayed in the Interface field of summary versions is not affected by the state of either the **aaa intf-desc-format include sub-intf** command or the **aaa intf-desc-format include adapter** command when the subscriber logs in.
- You can use the **ipv6** keyword to display all IPv6 subscribers or include the IPv6 prefix to limit the display to only IPv6 subscribers on a specific network.
- You can use the **summary** keyword to display only summary information about active subscribers.

Action To display general subscriber information:

```
host1#show subscribers
                          Subscriber List
                          ---------------
                                                              Virtual
      User Name           Type         Addr|Endpt             Router
----------------------   -----   --------------------   ------------
fred                     tst     10.10.65.86/radius     default
bert                     tst     192.168.10.3/user      default
      User Name                     Interface
----------------------   --------------------------------
fred                     atm 2/1.42:100.104
bert                     FastEthernet 5/2.4
      User Name              Login Time           Circuit Id
----------------------   -------------------   ----------------
fred                     06/05/12 10:58:42     atm 5/1.3
bert                     06/05/12 10:59:08
     User Name               Remote Id
----------------------   ----------------
fred
bert                     (800) 555-1212
```

To display detailed information for subscribers on the specified interface:

```
host1#show subscribers interface ethernet 5/2
                          Subscriber List
                          ---------------
                                                              Virtual
      User Name           Type         Addr|Endpt             Router
----------------------   -----   --------------------   ------------
bert                     tst     192.168.10.3/user      default
      User Name                     Interface
----------------------   --------------------------------
bert                     FastEthernet 5/2.4
      User Name              Login Time           Circuit Id
----------------------   -------------------   ----------------
bert                     06/05/12 10:59:08
      User Name              Remote Id
----------------------   ----------------
bert                     (800) 555-0000
```

To display detailed information for subscribers on the specified slot:

```
host1#show subscribers slot 5
                          Subscriber List
                          ---------------
                                                              Virtual
      User Name           Type         Addr|Endpt             Router
----------------------   -----   --------------------   ------------
fred                     tst     10.10.65.86/radius     default
      User Name                     Interface
----------------------   --------------------------------
fred                     atm 5/1.42:100.104
      User Name              Login Time           Circuit Id
----------------------   -------------------   ----------------
fred                     06/05/12 10:58:42     atm 5/1.3
      User Name              Remote Id
----------------------   ----------------
fred
```

To display the number of subscribers on each virtual router, as well as the total and peak subscribers for the chassis:

```
host1#show subscribers summary
  Virtual
   Router      Subscribers     Ppp       Ip      Tnl     Total
------------   ------------   ------   ------   ------   ------
default        1              1        0        0        1
Total Subscribers : 10 (chassis-wide total)
Peak  Subscribers : 15 (chassis-wide total)
```

To display the number of subscribers on each port:

```
host1#show subscribers summary port
Interface      Count
------------   ------
3/1            5
2/1            5
Total Subscribers : 10 (chassis-wide total)
Peak  Subscribers : 15 (chassis-wide total)
```

To display the number of subscribers by domain name:

```
host1#show subscribers summary domain
          Domain Name              Count
-------------------------------   ------
abc.com                           5
iii.com                           5
Total Subscribers : 10 (chassis-wide total)
Peak  Subscribers : 15 (chassis-wide total)
```

To display the number of subscribers by interface:

```
host1#show subscribers summary interface
     Interface         Count
--------------------   ------
ATM 3/2.1              1
ETHERNET 5/2.1         2
Total Subscribers : 3 (chassis-wide total)
Peak  Subscribers : 6 (chassis-wide total)
```

To display the number of subscribers by slot:

```
host1#show subscribers summary slot
  Slot     Count
--------   -----
3          1
5          4
Total Subscribers : 5 (chassis-wide total)
Peak  Subscribers : 8 (chassis-wide total)
```

Meaning Table 32 lists the **show subscribers** command output fields.

Table 32: show subscribers Output Fields

Field Name	Field Description
User Name	Name of the subscriber
Type	Type of subscriber: atm, ip, ipsec, ppp, tnl (tunnel), tst (test)
Addr | Endpt	IP or IPv6 address and source of the address: l2tp, local, dhcp, radius, user. For local, dhcp, radius, and user endpoints, the address is that of the user. When the endpoint is l2tp, the address is that of the LNS.
Virtual Router	Name of the virtual router context
Interface	Interface specifier over which the subscriber is connected
Login Time	Date, in YY/MM/DD format, and time the subscriber logged in
Circuit Id	User circuit ID value specified by PPPoE
Remote Id	User remote ID value specified by PPPoE
Total Subscribers	Number of active subscribers, chassis-wide
Peak Subscribers	Maximum value of the Total Subscriber field during the time the router has been active, chassis-wide
Subscribers	Number of subscribers; the sum of the Ppp and Ip fields
Ppp	Number of PPPoA and PPPoE users, combined
Ip	Number of DHCP and IP subscriber manager users, combined
Tnl	Number of users tunneled to an LNS
Total	Total number of users per virtual router; the sum of the Ppp, Ip, and Tnl fields
Domain Name	Domain name used by the subscriber
Count	Number of subscribers
Slot	Number of slot in the chassis

Related Topics

- **show subscribers** command

Monitoring Application Terminate Reason Mappings

Purpose Display information about the mappings for application terminate reasons.

Action To display the current terminate reasons that are mapped to a specific Acct-Terminate-Cause-Code:

This example uses the **radius** keyword to display all current terminate reasons mapped to RADIUS Acct-Terminate-Cause codes. The output lists all PPP mappings, followed by L2TP mappings, and then AAA mappings.

```
host1(config)#run show terminate-code radius
                                                                    Radius
  Apps          Terminate Reason              Description           Code
---------   -------------------------   -------------------------   ------
ppp         authenticate-authenticator  authenticate authenticator    17
            -timeout                     timeout
ppp         authenticate-challenge-tim  authenticate challenge tim    10
            eout                        eout
ppp         authenticate-chap-no-resou  authenticate chap no resou    10
            rces                        rces
ppp         authenticate-chap-peer-aut  authenticate chap peer aut    17
            henticator-timeout          henticator timeout
ppp         authenticate-deny-by-peer   authenticate deny by peer     17
ppp         authenticate-inactivity-ti  authenticate inactivity ti     4
            meout                       meout
ppp         authenticate-max-requests   authenticate max requests     10
 --More--
```

To display all terminate reasons that are mapped to a specific terminate code:

This example uses the **radius** keyword and a RADIUS Acct-Terminate-Cause code (**radius 4**) to display all terminate reasons mapped to the specified terminate code.

```
host1(config)#run show terminate-code radius 4
                                                                    Radius
  Apps          Terminate Reason              Description           Code
---------   -------------------------   -------------------------   ------
ppp         authenticate-inactivity-ti  authenticate inactivity ti     4
            meout                       meout
l2tp        session-timeout-inactivity  session timeout inactivity     4
```

To display all current mappings for a particular application's terminate reasons:

This example uses **aaa** as the application.

```
host1(config)#run show terminate-code aaa
                                                                    Radius
  Apps          Terminate Reason              Description           Code
---------   -------------------------   -------------------------   ------
aaa         deny-server-not-available   deny server not available     17
aaa         deny-server-request-timeou  deny server request timed     17
            t                           out
aaa         deny-authentication-failur  deny authentication failur    17
            e                           e from server
aaa         deny-address-assignment-fa  deny address assignment fa    17
            ilure                       ilure
aaa         deny-address-allocation-fa  deny address allocation fa    17
            ilure                       ilure
aaa         deny-no-address-allocation  deny insufficient resource    17
            -resources                  s for address allocation
aaa         deny-unknown-subscriber     deny no such server entry     17
aaa         deny-no-resources           deny no resources availabl    10
                                        e
 --More--
```

To display the mapping for a specific terminate reason for an application:

This example uses **l2tp** as the application and **session-access-interface-down** as the terminate reason.

```
host1#show terminate-code l2tp session-access-interface-down
                                                                  Radius
                Terminate Reason Description                       Code
------------------------------------------------------------   ------
session access interface down                                     8
```

Meaning Table 33 lists the **show terminate-code** command output fields.

Table 33: show terminate-code Output Fields

Field Name	Field Description
Apps	The application generating the terminate reason; AAA, L2TP, PPP, or RADIUS client
Terminate Reason	The application's terminate reason
Description	The terminate reason
Radius Code	The RADIUS Acct-Terminate-Cause code to which the application's terminate reason is mapped

Related Topics

- **show terminate-code** command

Part 2

Managing RADIUS and TACACS+

Chapter 3

Configuring RADIUS Attributes

This chapter identifies the Remote Authentication Dial-In User Service (RADIUS) attributes that JUNOSe software supports and describes the RADIUS attributes you can configure with the command-line interface (CLI). RADIUS attributes are discussed in the following sections:

Overview

RADIUS is a distributed client/server that protects networks against unauthorized access. RADIUS clients running on a E-series router send authentication requests to a central RADIUS server.

You can access the RADIUS server through either a subscriber line or the CLI.

NOTE: For CLI/telnet users only—For CLI security, the router supports the RADIUS Access-Challenge message. The RADIUS server uses this message to send the user a challenge requiring a response. The router then displays the single reply message and attempts to authenticate the user with the new response as the password.

The central RADIUS server stores all the required user authentication and network access information. RADIUS informs the router of the privilege levels for which RADIUS-authenticated users have enable access. The router permits or denies enable access accordingly.

The RADIUS server is configured and managed by a RADIUS administrator. See your RADIUS server documentation for information about configuring and managing a RADIUS server.

The E-series RADIUS client uses the IP address in the router ID unless you explicitly set an IP address by using the **radius update-source-addr** command. See *Configuring RADIUS Authentication and Accounting Servers* in *Chapter 1, Configuring Remote Access*.

To explicitly set the source address, perform the following tasks:

- Configure the RADIUS update-source address.
- Set this address on the RADIUS server if required.

NOTE: For additional RADIUS information about topics such as restricting user access, vty line authentication, or SSH, see *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.

RADIUS Services

RADIUS provides three distinct services:

- Authentication—Determines whether or not a user is allowed to access a specific service or resource.
- Authorization—Associates connection attributes or characteristics with a specific user.
- Accounting—Tracks service use by subscribers.

RADIUS Attributes

JUNOSe software supports the RADIUS attributes and vendor-specific attributes (VSAs) listed in this chapter. These attributes define specific authentication, authorization, and accounting elements in a user's profile. The profile is stored on the RADIUS server. RADIUS messages contain RADIUS attributes to communicate information between an E-series router and the RADIUS server.

Note these guidelines about RADIUS attribute numbers:

- The number, such as [1], that appears in brackets before each attribute is the attribute's standard number.
- Any attribute number beginning with 26, such as [26-1], identifies a vendor-specific attribute.

For a complete list of RADIUS attributes supported by JUNOSe software, see *Chapter 6, RADIUS Attribute Descriptions*.

Platform Considerations

RADIUS is supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about RADIUS, consult the following resources:

- RFC 2865—Remote Authentication Dial In User Service (RADIUS) (June 2000)
- RFC 2866—RADIUS Accounting (June 2000)
- RFC 2867—RADIUS Accounting Modifications for Tunnel Protocol Support (June 2000)
- RFC 2868—RADIUS Attributes for Tunnel Protocol Support (June 2000)
- RFC 2869—RADIUS Extensions (June 2000)
- RFC 4679—DSL Forum Vendor-Specific RADIUS Attributes (September 2006)
- GSMP extensions for layer2 control (L2C) Topology Discovery and Line Configuration—draft-wadhwa-gsmp-l2control-configuration-00.txt (July 2006 expiration)

Subscriber AAA Access Messages

Authorization and authentication access messages identify subscribers before the RADIUS server grants or denies them access to the network or network services. When an application requests user authentication, the request must have certain authenticating attributes, such as a user's name, password, and the particular type of service the user is requesting. This information is sent in the authentication request via the RADIUS protocol to the RADIUS server. In response, the RADIUS server grants or denies the request.

The router supports the following types of authentication and authorization messages:

- Access-Request—Requests client authentication. RADIUS responds to a client authentication request with either an Access-Accept, an Access-Reject, or an Access-Challenge message. An Access-Request message can contain a number of RADIUS attributes.
- Access-Accept—Grants the client's access request and can provide specific configuration information necessary to begin delivery of service to the user.

- Access-Reject—Sent if any value of the received attributes is not acceptable.
- Access-Challenge—Sent to the client, requesting additional authentication information.
- Change-of-Authorization-Request (CoA-Request)—Dynamically modifies session attributes, such as data filters.
- Disconnect-Request—Immediately terminates a user session.

Supported RADIUS IETF Attributes

Table 34 lists the Access-Request, Access-Accept, Access-Reject, Access-Challenge, CoA, and Disconnect-Request attributes supported by JUNOSe software. The following notes are referenced in Table 34:

1. Attribute is used by Access-Request messages when terminating a PPP connection at the LNS or the initiating LAC.
2. Attribute is used to support pass-through exchange of EAP messages.
3. Attribute is used by Access-Challenge messages to set the PPP retransmission timeout used for EAP request packets.

Table 34 lists the RADIUS IETF attributes supported for Access-Request, Access-Accept, Access-Reject, CoA-Request, and Disconnect-Request messages.

Table 34: AAA Access Message RADIUS IETF Attributes Supported

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	Access-Challenge	CoA-Request	Disconnect-Request
[1]	User-Name	✔	✔	–	–	✔	✔
[2]	User-Password	✔	–	–	–	–	–
[3]	CHAP-Password	✔	–	–	–	–	–
[4]	NAS-IP-Address	✔	–	–	–	–	–
[5]	NAS-Port	✔	–	–	–	–	–
[6]	Service-Type	✔	✔	–	–	–	–
[7]	Framed-Protocol	✔	✔	–	–	–	–
[8]	Framed-IP-Address	✔	✔	–	–	✔	–
[9]	Framed-IP-Netmask	–	✔	–	–	–	–
[11]	Filter-Id	–	✔	–	–	–	–
[12]	Framed-MTU (See Note 2 on page 142.)	✔	✔	–	–	–	–
[18]	Reply-Message (See Note 2 on page 142.)	–	✔	✔	✔	–	–
[22]	Framed-Route	–	✔	–	–	–	–
[24]	State (See Note 2 on page 142.)	–	–	–	✔	–	–

Table 34: AAA Access Message RADIUS IETF Attributes Supported (continued)

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	Access-Challenge	CoA-Request	Disconnect-Request
[25]	Class	–	✔	–	–	–	–
[27]	Session-Timeout (See Note 2 on page 142.) (See Note 3 on page 142.)	–	✔	✔	✔	–	–
[28]	Idle-Timeout	–	✔	–	–	–	–
[30]	Called-Station-Id	✔	–	–	–	–	–
[31]	Calling-Station-Id	✔	–	–	–	✔	–
[32]	NAS-Identifier	✔	–	–	–	–	–
[33]	Proxy-State	✔	–	–	–	–	–
[44]	Acct-Session-Id	✔	–	–	–	✔	–
[50]	Acct-Multi-Session-Id	✔	–	–	–	–	✔
[60]	CHAP-Challenge	✔	–	–	–	–	–
[61]	NAS-Port-Type	✔	–	–	–	–	–
[62]	Port-Limit	–	✔	–	–	–	–
[64]	Tunnel-Type (See Note 1 on page 142.)	✔	✔	–	–	–	–
[65]	Tunnel-Medium-Type (See Note 1 on page 142.)	✔	✔	–	–	–	–
[66]	Tunnel-Client-Endpoint (See Note 1 on page 142.)	✔	✔	–	–	–	–
[67]	Tunnel-Server-Endpoint (See Note 1 on page 142.)	✔	✔	–	–	–	–
[68]	Acct-Tunnel-Connection (See Note 1 on page 142.)	✔	–	–	–	–	–
[69]	Tunnel-Password	–	✔	–	–	–	–
[77]	Connect-Info	✔	–	–	–	–	–
[79]	EAP-Message (See Note 2 on page 142.)	✔	✔	✔	✔	–	–
[80]	Message-Authenticator (See Note 2 on page 142.)	✔	✔	✔	✔	–	–
[82]	Tunnel-Assignment-Id	–	✔	–	–	–	–
[83]	Tunnel-Preference	–	✔	–	–	–	–
[85]	Acct-Interim-Interval	–	✔	–	–	–	–
[87]	NAS-Port-Id	✔	–	–	–	✔	–
[88]	Framed-Pool	–	✔	–	–	–	–
[90]	Tunnel-Client-Auth-Id (See Note 1 on page 142.)	✔	✔	–	–	–	–
[91]	Tunnel-Server-Auth-Id (See Note 1 on page 142.)	✔	✔	–	–	–	–

Table 34: AAA Access Message RADIUS IETF Attributes Supported (continued)

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	Access-Challenge	CoA-Request	Disconnect-Request
[96]	Framed-Interface-Id	–	✔	–	–	–	–
[97]	Framed-Ipv6-Prefix	–	✔	–	–	–	–
[99]	Framed-Ipv6-Route	–	✔	–	–	–	–
[101]	Error-Cause	–	–	–	–	✔	✔
[135]	Ascend-Primary-Dns	–	✔	–	–	–	–
[136]	Ascend-Secondary-Dns	–	✔	–	–	–	–
[188]	Ascend-Num-In-Multilink	✔	–	–	–	–	–
[242]	Ascend-Data-Filter	–	✔	–	–	–	–

Supported Juniper Networks VSAs

Table 35 lists the Juniper Networks (Vendor ID 4874) VSAs supported for Access-Request, Access-Accept, Access-Reject, CoA-Request, and Disconnect-Request messages.

Table 35: AAA Access Message Juniper Networks (Vendor ID 4874) VSAs Supported

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	CoA-Request	Disconnect-Request
[26-1]	Virtual-Router	–	✔	–	✔	–
[26-2]	Local-Address-Pool	–	✔	–	–	–
[26-3]	Local-Loopback-Interface	–	✔	–	–	–
[26-4]	Primary-DNS	–	✔	–	–	–
[26-5]	Secondary-DNS	–	✔	–	–	–
[26-6]	Primary-WINS (NBNS)	–	✔	–	–	–
[26-7]	Secondary-WINS (NBNS)	–	✔	–	–	–
[26-8]	Tunnel-Virtual-Router	–	✔	–	–	–
[26-9]	Tunnel-Password	–	✔	–	–	–
[26-10]	Ingress-Policy-Name	–	✔	–	–	–
[26-11]	Egress-Policy-Name	–	✔	–	–	–
[26-12]	Ingress-Statistics	–	✔	–	–	–
[26-13]	Egress-Statistics	–	✔	–	–	–
[26-14]	Service-Category	–	✔	–	–	–
[26-15]	PCR	–	✔	–	–	–
[26-16]	SCR	–	✔	–	–	–
[26-17]	Mbs	–	✔	–	–	–
[26-22]	Sa-Validate	–	✔	–	–	–

Table 35: AAA Access Message Juniper Networks (Vendor ID 4874) VSAs Supported (continued)

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	CoA-Request	Disconnect-Request
[26-23]	IGMP-Enable	–	✔	–	–	–
[26-24]	Pppoe-Description	✔	–	–	–	–
[26-25]	Redirect-Vrouter-Name	–	✔	–	–	–
[26-26]	Qos-Profile-Name	–	✔	–	–	–
[26-30]	Tunnel-Nas-Port-Method	–	✔	–	–	–
[26-31]	SSC-Service-Bundle-Name	–	✔	–	–	–
[26-33]	Tunnel-Max-Sessions	–	✔	–	–	–
[26-34]	Framed-IP-Route-Tag	–	✔	–	–	–
[26-44]	Tunnel-Interface-ID	✔	–	–	–	–
[26-45]	Ipv6-Virtual-Router	–	✔	–	–	–
[26-46]	Ipv6-Local-Interface	–	✔	–	–	–
[26-47]	Ipv6-Primary-DNS	–	✔	–	–	–
[26-48]	Ipv6-Secondary-DNS	–	✔	–	–	–
[26-52]	RADIUS-Client-Address	✔	–	–	–	–
[26-53]	Service-Description	✔	–	–	–	–
[26-54]	L2tp-Recv-Window-Size	–	✔	–	–	–
[26-55]	DHCP-Options	✔	–	–	–	–
[26-56]	DHCP-MAC-Address	✔	–	–	–	–
[26-57]	DHCP-GI-Address	✔	–	–	–	–
[26-58]	LI-Action	–	✔	–	✔	–
[26-59]	Med-Dev-Handle	–	✔	–	✔	–
[26-60]	Med-Ip-Address	–	✔	–	✔	–
[26-61]	Med-Port-Number	–	✔	–	✔	–
[26-62]	MLPPP-Bundle-Name	✔	–	–	–	–
[26-63]	Interface-Desc	✔	–	–	–	–
[26-64]	Tunnel-Group	–	✔	–	–	–
[26-65]	Activate-Service	–	✔	–	✔	–
[26-66]	Deactivate-Service	–	✔	–	✔	–
[26-67]	Service-Volume	–	✔	–	✔	–
[26-68]	Service-Timeout	–	✔	–	✔	–
[26-69]	Service-Statistics	–	✔	–	✔	–
[26-70]	Ignore-DF-Bit	–	✔	–	–	–
[26-71]	IGMP-Access-Name	–	✔	–	–	–
[26-72]	IGMP-Access-Src-Name	–	✔	–	–	–

Table 35: AAA Access Message Juniper Networks (Vendor ID 4874) VSAs Supported (continued)

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	CoA-Request	Disconnect-Request
[26-73]	IGMP-OIF-Map-Name	–	✔	–	–	–
[26-74]	MLD-Access-Name	–	✔	–	–	–
[26-75]	MLD-Access-Src-Name	–	✔	–	–	–
[26-76]	MLD-OIF-Map-Name	–	✔	–	–	–
[26-77]	MLD-Version	–	✔	–	–	–
[26-78]	IGMP-Version	–	✔	–	–	–
[26-79]	IP-Mcast-Adm-Bw-Limit	–	✔	–	–	–
[26-80]	IPv6-Mcast-Adm-Bw-Limit	–	✔	–	–	–
[26-81]	L2c-Information	✔	–	–	–	–
[26-82]	QoS-Parameters	–	✔	–	–	–
[26-84]	Mobile-IP-Algorithm	–	✔	–	–	–
[26-85]	Mobile-IP-SPI	–	✔	–	–	–
[26-86]	Mobile-IP-Key	–	✔	–	–	–
[26-87]	Mobile-IP-Replay	–	✔	–	–	–
[26-88]	Mobile-IP-Access-Control-List	–	✔	–	–	–
[26-89]	Mobile-IP-Lifetime	–	✔	–	–	–
[26-90]	L2TP-Resynch-Method	–	✔	–	–	–
[26-91]	Tunnel-Switch-Profile	–	✔	–	–	–
[26-92]	L2C-Up-Stream-Data	✔	–	–	–	–
[26-93]	L2C-Down-Stream-Data	✔	–	–	–	–
[26-94]	Tunnel-Tx-Speed-Method	–	✔	–	–	–
[26-95]	IGMP-Query-Interval	–	✔	–	–	–
[26-96]	IGMP-Max-Resp-Time	–	✔	–	–	–
[26-97]	IGMP-Immediate-Leave	–	✔	–	–	–
[26-98]	MLD-Query-Interval	–	✔	–	–	–
[26-99]	MLD-Max-Resp-Time	–	✔	–	–	–
[26-100]	MLD-Immediate-Leave	–	✔	–	–	–
[26-110]	Acc-Loop-Cir-Id	✔	–	–	–	–
[26-111]	Acc-Aggr-Cir-Id-Bin	✔	–	–	–	–
[26-112]	Acc-Aggr-Cir-Id-Asc	✔	–	–	–	–
[26-113]	Act-Data-Rate-Up	✔	–	–	–	–
[26-114]	Act-Data-Rate-Dn	✔	–	–	–	–
[26-115]	Min-Data-Rate-Up	✔	–	–	–	–
[26-116]	Min-Data-Rate-Dn	✔	–	–	–	–

Table 35: AAA Access Message Juniper Networks (Vendor ID 4874) VSAs Supported (continued)

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Reject	CoA-Request	Disconnect-Request
[26-117]	Att-Data-Rate-Up	✔	–	–	–	–
[26-118]	Att-Data-Rate-Dn	✔	–	–	–	–
[26-119]	Max-Data-Rate-Up	✔	–	–	–	–
[26-120]	Max-Data-Rate-Dn	✔	–	–	–	–
[26-121]	Min-LP-Data-Rate-Up	✔	–	–	–	–
[26-122]	Min-LP-Data-Rate-Dn	✔	–	–	–	–
[26-123]	Max-Interlv-Delay-Up	✔	–	–	–	–
[26-124]	Act-Interlv-Delay-Up	✔	–	–	–	–
[26-125]	Max-Interlv-Delay-Dn	✔	–	–	–	–
[26-126]	Act-Interlv-Delay-Dn	✔	–	–	–	–
[26-127]	DSL-Line-State	✔	–	–	–	–
[26-128]	DSL-Type	✔	–	–	–	–
[26-129]	Ipv6-NdRa-Prefix	–	✔	–	–	–
[26-140]	Service-Interim-Acct-Interval	–	✔	–	✔	–
[26-141]	Downstream-Calculated-Qos-Rate	✔	–	–	–	–
[26-142]	Upstream-Calculated-Qos-Rate	✔	–	–	–	–

Subscriber AAA Accounting Messages

Accounting messages identify service provisions and use on a per-user or per-tunnel basis. These messages keep track of when a particular service is initiated and terminated for a specific user.

JUNOSe software supports the Acct-On message on startup or configuration of the first accounting server. Acct-Off messages are supported when the last RADIUS accounting server in a virtual router is removed, when the router is shut down, and when a virtual router that has configured RADIUS accounting servers is deleted.

The router supports the following types of accounting messages:

- Acct-Start
- Acct-Stop
- Interim-Acct
- Acct-On
- Acct-Off

Supported RADIUS IETF Attributes

Table 36 lists the RADIUS IETF attributes supported for Acct-Start, Acct-Stop, Interim-Acct, Acct-On, and Acct-Off messages.

The following notes are referred to in Table 36:

1. The attribute is used when terminating a PPP connection at the LNS or the initiating LAC.

2. For this attribute to be included, an IP address must be assigned to the subscriber.

3. The attribute is not included in Acct-Stop messages that are sent when a user session does not get established in one of the following situations.

   - The **aaa accounting acct-stop on-access-deny** command is enabled and the authentication server sends an Access-Reject (deny) message.

   - The **aaa accounting acct-stop on-aaa-failure** command is enabled and the authentication server issues an Access-Accept message (grant), but the AAA configuration denies access for the user. The **aaa accounting acct-stop on-aaa-failure** is enabled by default.

   - The **aaa accounting acct-stop on-aaa-failure** command is enabled and the user terminates before AAA receives the authentication response from the authentication server.

4. For this attribute to be included, an IPv6 interface ID must be assigned to the subscriber.

5. For this attribute to be included, at least one IPv6 prefix must be assigned to the subscriber.

Table 36: AAA Accounting Message RADIUS IETF Attributes Supported

Attribute Number	Attribute Name	Acct-Start	Acct-Stop	Interim-Acct	Acct-On	Acct-Off
[1]	User-Name	✔	✔	✔	–	–
[4]	NAS-IP-Address	✔	✔	✔	✔	✔
[5]	NAS-Port	✔	✔	✔	–	–
[6]	Service-Type	✔	✔	✔	–	–
[7]	Framed-Protocol (See Note 3 on page 148.)	✔	✔	✔	–	–
[8]	Framed-IP-Address (See Note 2 on page 148.)	✔	✔	✔	–	–
[9]	Framed-IP-Netmask	✔	✔	✔	–	–
[13]	Framed-Compression (See Note 3 on page 148.)	✔	✔	✔	–	–
[25]	Class	✔	✔	✔	–	–
[30]	Called-Station-Id	✔	✔	✔	–	–

Table 36: AAA Accounting Message RADIUS IETF Attributes Supported (continued)

Attribute Number	Attribute Name	Acct-Start	Acct-Stop	Interim-Acct	Acct-On	Acct-Off
[31]	Calling-Station-Id	✔	✔	✔	–	–
[32]	NAS-Identifier	✔	✔	✔	✔	✔
[40]	Acct-Status-Type	✔	✔	✔	✔	✔
[41]	Acct-Delay-Time	✔	✔	✔	✔	✔
[42]	Acct-Input-Octets	–	✔	✔	–	–
[43]	Acct-Output-Octets	–	✔	✔	–	–
[44]	Acct-Session-Id	✔	✔	✔	✔	✔
[45]	Acct-Authentic	✔	✔	✔	✔	✔
[46]	Acct-Session-Time	–	✔	✔	–	–
[47]	Acct-Input-Packets	–	✔	✔	–	–
[48]	Acct-Output-Packets	–	✔	✔	–	–
[49]	Acct-Terminate-Cause	–	✔	–	–	✔
[50]	Acct-Multi-Session-Id (See Note 3 on page 148.)	✔	✔	✔	–	–
[51]	Acct-Link-Count (See Note 3 on page 148.)	✔	✔	✔	–	–
[52]	Acct-Input-Gigawords	–	✔	✔	–	–
[53]	Acct-Output-Gigawords	–	✔	✔	–	–
[55]	Event-Timestamp	✔	✔	✔	✔	✔
[61]	NAS-Port-Type	✔	✔	✔	–	–
[64]	Tunnel-Type (See Note 1 on page 148.)	✔	✔	✔	–	–
[65]	Tunnel-Medium-Type (See Note 1 on page 148.)	✔	✔	✔	–	–
[66]	Tunnel-Client-Endpoint (See Note 1 on page 148.)	✔	✔	✔	–	–
[67]	Tunnel-Server-Endpoint (See Note 1 on page 148.)	✔	✔	✔	–	–
[68]	Acct-Tunnel-Connection (See Note 1 on page 148.)	✔	✔	✔	–	–
[77]	Connect-Info	✔	✔	✔	–	–
[82]	Tunnel-Assignment-Id (LAC only) (See Note 1 on page 148.)	✔	✔	✔	–	–
[83]	Tunnel-Preference (LAC only)	✔	✔	✔	–	–
[87]	NAS-Port-Id	✔	✔	✔	–	–
[90]	Tunnel-Client-Auth-Id (See Note 1 on page 148.)	✔	✔	✔	–	–
[91]	Tunnel-Server-Auth-Id (See Note 1 on page 148.)	✔	✔	✔	–	–

Table 36: AAA Accounting Message RADIUS IETF Attributes Supported (continued)

Attribute Number	Attribute Name	Acct-Start	Acct-Stop	Interim-Acct	Acct-On	Acct-Off
[96]	Framed-Interface-Id (See Note 4 on page 148.)	✔	✔	✔	–	–
[97]	Framed-Ipv6-Prefix (See Note 5 on page 148.)	✔	✔	✔	–	–
[188]	Ascend-Num-In-Multilink (See Note 3 on page 148.)	✔	✔	✔	–	–

Supported Juniper Networks VSAs

Table 37 lists the Juniper Networks (Vendor ID 4874) VSAs supported for Acct-Start, Acct-Stop, Interim-Acct, Acct-On, and Acct-Off messages.

The following note is referred to in Table 37:

1. The attribute is not included in Acct-Stop messages that are sent when a user session does not get established in one of the following situations.

   - The **aaa accounting acct-stop on-access-deny** command is enabled and the authentication server sends an Access-Reject (deny) message.
   - The **aaa accounting acct-stop on-aaa-failure** command is enabled and the authentication server issues an Access-Accept message (grant), but the AAA configuration denies access for the user. The **aaa accounting acct-stop on-aaa-failure** is enabled by default.
   - The **aaa accounting acct-stop on-aaa-failure** command is enabled and the user terminates before AAA receives the authentication response from the authentication server.

Table 37: AAA Accounting Message Juniper Network (Vendor ID 4874) VSAs Supported

Attribute Number	Attribute Name	Acct-Start	Acct-Stop	Interim-Acct	Acct-On	Acct-Off
[26-10]	Ingress-Policy-Name	✔	✔	✔	–	–
[26-11]	Egress-Policy-Name	✔	✔	✔	–	–
[26-24]	Pppoe-Description (See Note 1 on page 150.)	✔	✔	✔	–	–
[26-42]	Acct-Input-Gigapackets	–	✔	✔	–	–
[26-43]	Acct-Output-Gigapackets	–	✔	✔	–	–
[26-44]	Tunnel-Interface-Id	✔	✔	✔	–	–
[26-51]	Disconnect-Cause	–	✔	–	–	–
[26-53]	Service-Description	✔	✔	✔	–	–
[26-55]	DHCP-Options (See Note 1 on page 150.)	✔	✔	✔	–	–
[26-56]	DHCP-MAC-Address (See Note 1 on page 150.)	✔	✔	✔	–	–

Table 37: AAA Accounting Message Juniper Network (Vendor ID 4874) VSAs Supported (continued)

Attribute Number	Attribute Name	Acct-Start	Acct-Stop	Interim-Acct	Acct-On	Acct-Off
[26-57]	DHCP-GI-Address (See Note 1 on page 150.)	✔	✔	✔	–	–
[26-62]	MLPPP-Bundle-Name	✔	✔	✔	–	–
[26-63]	Interface-Description	✔	✔	✔	–	–
[26-92]	L2C-Up-Stream-Data	✔	✔	✔	–	–
[26-93]	L2C-Down-Stream-Data	✔	✔	✔	–	–
[26-110]	Acc-Loop-Cir-Id	✔	✔	✔	–	–
[26-111]	Acc-Aggr-Cir-Id-Bin	✔	✔	✔	–	–
[26-112]	Acc-Aggr-Cir-Id-Asc	✔	✔	✔	–	–
[26-113]	Act-Data-Rate-Up	✔	✔	✔	–	–
[26-114]	Act-Data-Rate-Dn	✔	✔	✔	–	–
[26-115]	Min-Data-Rate-Up	✔	✔	✔	–	–
[26-116]	Min-Data-Rate-Dn	✔	✔	✔	–	–
[26-117]	Att-Data-Rate-Up	✔	✔	✔	–	–
[26-118]	Att-Data-Rate-Dn	✔	✔	✔	–	–
[26-119]	Max-Data-Rate-Up	✔	✔	✔	–	–
[26-120]	Max-Data-Rate-Dn	✔	✔	✔	–	–
[26-121]	Min-LP-Data-Rate-Up	✔	✔	✔	–	–
[26-122]	Min-LP-Data-Rate-Dn	✔	✔	✔	–	–
[26-123]	Max-Interlv-Delay-Up	✔	✔	✔	–	–
[26-124]	Act-Interlv-Delay-Up	✔	✔	✔	–	–
[26-125]	Max-Interlv-Delay-Dn	✔	✔	✔	–	–
[26-126]	Act-Interlv-Delay-Dn	✔	✔	✔	–	–
[26-127]	DSL-Line-State	✔	✔	✔	–	–
[26-128]	DSL-Type	✔	✔	✔	–	–

Tunnel Accounting Messages

Table 38 lists RADIUS attributes supported by the following tunnel-related accounting messages:

- Acct-Tunnel-Start
- Acct-Tunnel-Stop
- Acct-Tunnel-Reject

- Acct-Tunnel-Link-Start
- Acct-Tunnel-Link-Stop
- Acct-Tunnel-Link-Reject

Table 38: AAA Accounting Tunnel Message RADIUS Attributes Supported

Attribute Number	Attribute Name	Acct-Tunnel-Start	Acct-Tunnel-Stop	Acct-Tunnel-Reject	Acct-Tunnel-Link-Start	Acct-Tunnel-Link-Stop	Acct-Tunnel-Link-Reject
[1]	User-Name	–	–	–	✔	✔	–
[4]	NAS-IP-Address	✔	✔	✔	✔	✔	✔
[26-51]	Disconnect-Cause	–	–	–	–	✔	–
[32]	NAS-Identifier	✔	✔	✔	✔	✔	✔
[40]	Acct-Status-Type	✔	✔	✔	✔	✔	✔
[41]	Acct-Delay-Time	✔	✔	✔	✔	✔	✔
[44]	Acct-Session-Id	✔	✔	✔	✔	✔	✔
[46]	Acct-Session-Time	–	✔	–	–	✔	–
[49]	Acct-Terminate-Cause	–	✔	✔	–	✔	✔
[55]	Event-Timestamp	✔	✔	✔	✔	✔	✔
[64]	Tunnel-Type	✔	✔	✔	✔	✔	✔
[65]	Tunnel-Medium-Type	✔	✔	✔	✔	✔	✔
[66]	Tunnel-Client-Endpoint	✔	✔	✔	✔	✔	✔
[67]	Tunnel-Server-Endpoint	✔	✔	✔	✔	✔	✔
[68]	Acct-Tunnel-Connection	✔	✔	✔	✔	✔	✔
[82]	Tunnel-Assignment-Id (LAC only)	✔	✔	✔	✔	✔	✔
[83]	Tunnel-Preference (LAC only)	–	–	–	✔	✔	✔
[86]	Acct-Tunnel-Packets-Lost	–	–	–	–	✔	✔
[90]	Tunnel-Client-Auth-Id	✔	✔	✔	✔	✔	✔
[91]	Tunnel-Server-Auth-Id	✔	✔	✔	✔	✔	✔

DSL Forum VSAs in AAA Access and Accounting Messages

JUNOSe software supports the inclusion of a set of DSL Forum vendor-specific attributes (VSAs) in the following AAA access and accounting messages:

- Access-Request
- Acct-Start
- Acct-Stop
- Interim-Acct (if Acct-Stop messages are specified)

The DSL Forum VSAs convey information about the subscriber associated with the digital subscriber line (DSL) and the data rate of the DSL. When you use the **radius include dsl-forum-attributes** command to enable inclusion of the DSL Forum VSAs in these AAA messages, the router includes all of the attributes listed in Table 39 in the specified message, provided that the VSA is available in the information that the router receives from the digital subscriber line access multiplexer (DSLAM).

NOTE: JUNOSe software also supports several Juniper Networks VSAs that you can use to include DSL-related information. See *Juniper Networks VSAs* in *Chapter 6, RADIUS Attribute Descriptions*.

Table 39 lists the DSL Forum VSAs supported by JUNOSe software in Access-Request, Acct-Start, Acct-Stop, and (if Acct-Stop is specified) Interim-Acct messages. JUNOSe software uses the vendor ID assigned to the DSL Forum (3561, or DE9 in hexadecimal format) by the Internet Assigned Numbers Authority (IANA).

For information about configuring inclusion of the DSL Forum VSAs, see *DSL Forum Vendor-Specific Attributes* on page 189. For a detailed description of the DSL Forum VSAs supported by JUNOSe software, see *DSL Forum VSAs* in *Chapter 6, RADIUS Attribute Descriptions*.

Table 39: DSL Forum (Vendor ID 3561) VSAs Supported in AAA Access and Accounting Messages

Attribute Number	Attribute Name	Access-Request	Acct-Start	Acct-Stop	Interim-Acct
[26-1]	Agent-Circuit-Id	✔	✔	✔	✔
[26-2]	Agent-Remote-Id	✔	✔	✔	✔
[26-129]	Actual-Data-Rate-Upstream	✔	✔	✔	✔
[26-130]	Actual-Data-Rate-Downstream	✔	✔	✔	✔
[26-131]	Minimum-Data-Rate-Upstream	✔	✔	✔	✔
[26-132]	Minimum-Data-Rate-Downstream	✔	✔	✔	✔
[26-133]	Attainable-Data-Rate-Upstream	✔	✔	✔	✔
[26-134]	Attainable-Data-Rate-Downstream	✔	✔	✔	✔
[26-135]	Maximum-Data-Rate-Upstream	✔	✔	✔	✔
[26-136]	Maximum-Data-Rate-Downstream	✔	✔	✔	✔

Table 39: DSL Forum (Vendor ID 3561) VSAs Supported in AAA Access and Accounting Messages (continued)

Attribute Number	Attribute Name	Access-Request	Acct-Start	Acct-Stop	Interim-Acct
[26-137]	Minimum-Data-Rate-Upstream-Low-Power	✔	✔	✔	✔
[26-138]	Minimum-Data-Rate-Downstream-Low-Power	✔	✔	✔	✔
[26-139]	Maximum-Interleaving-Delay-Upstream	✔	✔	✔	✔
[26-140]	Actual-Interleaving-Delay-Upstream	✔	✔	✔	✔
[26-141]	Maximum-Interleaving-Delay-Downstream	✔	✔	✔	✔
[26-142]	Actual-Interleaving-Delay-Downstream	✔	✔	✔	✔
[26-144]	Access-Loop-Encapsulation	✔	✔	✔	✔
[26-254]	IWF-Session	✔	✔	✔	✔

CLI AAA Messages

There are four types of AAA messages used by CLI users to gain administrative access to the router. Access-Challenge attributes pertain only to CLI/telnet users.

- Access-Request
- Access-Accept
- Access-Challenge
- Access-Reject

Table 40 lists the RADIUS attributes supported for CLI AAA messages.

Table 40: CLI AAA Access Message RADIUS Attributes Supported

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Challenge	Access-Reject
[1]	User-Name	✔	–	–	–
[2]	User Password	✔	–	–	–
[4]	NAS-IP-Address	✔	–	–	–
[6]	Service-Type	✔	✔	–	–
[18]	Reply-Message	–	–	✔	✔
[24]	State (Access-Request is only in response to an Access-Challenge)	✔	–	✔	–
[25]	Class	–	✔	–	–
[26-1]	Virtual-Router	–	✔	–	–
[26-18]	Init-CLI-Access-Level	–	✔	–	–
[26-19]	Allow-All-VR-Access	–	✔	–	–

Table 40: CLI AAA Access Message RADIUS Attributes Supported (continued)

Attribute Number	Attribute Name	Access-Request	Access-Accept	Access-Challenge	Access-Reject
[26-20]	Alt-CLI-Access-Level	–	✔	–	–
[26-21]	Alt-CLI-Virtual-Router-Name	–	✔	–	–
[26-25]	Redirect-Vrouter-Name	–	✔	–	–

CLI Commands Used to Modify RADIUS Attributes

This section discusses the RADIUS Internet Engineering Task Force (IETF) attributes and the Juniper Networks vendor-specific attributes that you can configure using CLI commands.

For many attributes, you can configure the router to include the attribute in RADIUS messages. For more information, see *Including or Excluding Attributes in RADIUS Messages* on page 190.

You can also configure the router to ignore many attributes that it receives in Access-Accept messages. For more information, see *Ignoring Attributes When Receiving Access-Accept Messages* on page 191.

For a complete list of RADIUS attributes supported by JUNOSe software, see *Chapter 6, RADIUS Attribute Descriptions*.

RADIUS IETF Attributes

This section describes the RADIUS IETF attributes that you can configure using CLI commands. The attributes are listed numerically—each attribute is followed by a list of the commands that you can use to manage the attribute and descriptions of each command.

[4] NAS-IP-Address

Use the following commands to configure, manage, and display information for the NAS-IP-Address RADIUS attribute.

- **radius override nas-ip-addr tunnel-client-endpoint**
- **radius override nas-info**

radius override nas-ip-addr tunnel-client-endpoint

- Use to configure the RADIUS client (LNS) to use the tunnel-client-endpoint (LAC) IP address for the NAS-IP-Address attribute.
- Example

  host1(config)#**radius override nas-ip-addr tunnel-client-endpoint**

- Use the **no** version to restore the default address.

radius override nas-info

- Use in the correct virtual router context to override standard use of NAS-IP-Address and NAS-Identifier attributes for AAA broadcast accounting; specifies that the attributes for the authentication virtual router be included in accounting packets instead of the attributes for the virtual router that generates the accounting information.
- Example

  host1(config)#**virtual-router vrXyz1**
  host1:vrXyz1(config)#**radius override nas-info**

- Use the **no** version to restore standard use of the NAS-IP-Address and NAS-Identifier attributes.

Related Topics

- Monitoring Override Settings of RADIUS IETF Attributes on page 246

[5] NAS-Port

Use the following commands to manage and display information for the NAS-Port RADIUS attribute:

- **radius include nas-port**
- **radius nas-port-format**
- **radius nas-port-format extended**
- **radius pppoe nas-port-format unique**
- **radius vlan nas-port-format stacked**

radius include nas-port

- Use to include the NAS-Port attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include nas-port acct-start enable**

- Use the **no** version to restore the default, enable.

radius nas-port-format

- Use to set the NAS-Port format attribute for ATM and Ethernet only to either *0ssssppp* or *ssss0ppp*.
- The format is a 4-octet integer. The remaining bits are not changed (8 bits VPI and 16 bits VCI; or 12 bits S-VLAN and 12 bits VLAN).
- The *s* indicates a bit used to represent the *slot;* the *p* indicates a bit used to represent the *port* from which the authentication request originates.

- Example: If the PPP user is received on a VC from the card in slot 7, port 2, then the bit pattern is either 00111010 (for *0sssssppp*) or 01110010 (for *ssss0ppp*).

  host1(config)#**radius nas-port-format Osssssppp**

- Use the **no** version to restore the default.

radius nas-port-format extended atm

radius nas-port-format extended ethernet

- Use to set the NAS-Port format attribute for ATM, Gigabit Ethernet, and 10-Gigabit Ethernet interfaces on the E120 and E320 routers only.
- The format attribute set using the **radius nas-port-format** command does not accommodate the number of bits required by the ATM interface specifier (*slot/adapter/port/vpi/vci*) or the Gigabit Ethernet and 10-Gigabit Ethernet interface specifier [*slot/adapter/port*] [*.vlanSubinterface*]. Issuing this command enables you to encode the interface information in the attribute by specifying the number of bits available for each field in the interface specifier.

NOTE: You must use this command with the **extended** keyword when you configure the NAS-Port format attribute on routers that have line modules that support more than seven physical ports.

- The default number of bits for each field in the interface specifier for ATM interfaces are:
  - Slot—5 bits
  - Adapter—0 bits
  - Port—3 bits
  - VPI—8 bits
  - VCI—16 bits
- The default number of bits for each field in the interface specifier for Gigabit Ethernet and 10-Gigabit Ethernet interfaces are:
  - Slot—5 bits
  - Adapter—0 bits
  - Port—3 bits
  - VLAN—12 bits
  - S-VLAN—12 bits
- To set valid S-VLAN widths on Gigabit Ethernet and 10-Gigabit Ethernet interfaces, you must include S-VLAN IDs in the NAS-Port attribute by issuing the **radius vlan nas-port-format stacked** command.
- The total number of bits for all fields cannot exceed 32. When the total number of bits is less than 32, the NAS-Port attribute is right-justified and the extra bits are set to 0. If you do not specify a value for a field, the number of bits is set to 0.

- Example 1—Sets the field widths for ATM interfaces

  host1(config)#**radius nas-port-format extended atm field-widths slot 4 adapter 1 vpi 7 vpi 17**

- Example 2—Sets the field widths for Gigabit Ethernet and 10-Gigabit Ethernet interfaces

  host1(config)#**radius nas-port-format extended ethernet field-widths slot 4 adapter 1 port 3 vlan 12**

- Use the **no** version to restore the default behavior of the **radius nas-port-format** command.

radius pppoe nas-port-format unique

- Use to set the NAS-Port attribute to a unique value for subscribers on PPPoE interface. This unique value is derived from the subscriber's profileHandle.
- Example

  host1(config)#**radius pppoe nas-port-format unique**

- Use the **no** version to return to the default, in which the value is determined by the interface.

radius vlan nas-port-format stacked

- Use to include the S-VLAN ID, in addition to the VLAN ID, in the NAS-Port attribute for subscribers on Ethernet interfaces.
- The VLAN ID is always included whether the S-VLAN ID inclusion feature is enabled or disabled.
- The **radius pppoe nas-port-format unique** command overrides this command.
- Example

  host1(config)#**radius vlan nas-port-format stacked**

- Use the **no** version to return to the default, in which the S-VLAN ID is not included.

Related Topics

- Monitoring the NAS-Port-Format RADIUS Attribute on page 247

[8] Framed-IP-Address

Use the following command to manage the Framed-IP-Address RADIUS attribute.

- **radius include framed-ip-addr**

radius include framed-ip-addr

- Use to include the Framed-IP-Address attribute in Acct-Start and Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.

- For RADIUS to include this attribute, an IP address must be assigned to the subscriber.
- Example

  host1(config)#**radius include framed-ip-addr acct-start enable**

- Use the **no** version to restore the default, enable.

[9] Framed-Ip-Netmask

Use the following commands to manage the Framed-IP-Netmask RADIUS attribute.

- **radius include framed-ip-netmask**
- **radius ignore framed-ip-netmask**

radius include framed-ip-netmask

- Use to include the Framed-Ip-Netmask attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include framed-ip-netmask acct-start enable**

- Use the **no** version to restore the default, enable.

radius ignore framed-ip-netmask

- Use to cause the Framed-Ip-Netmask attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- If the subnet mask is specified by the Frame-Ip-Netmask attribute in the RADIUS user profile, the router passes the mask and IP address to the CPE during IPCP negotiations. When this command is enabled, the default subnet mask 255.255.255.255 is provided by AAA and used for IPCP negotiations.
- Enabling the command guards against any breaks in the negotiation.
- Example

  host1(config)#**radius ignore framed-ip-netmask disable**

- Use the **no** version to restore the default, enable.

[13] Framed-Compression

Use the following command to manage the Framed-Compression RADIUS attribute.

- **radius include framed-compression**

radius include framed-compression

- Use to include the Framed-Compression attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include framed-compression acct-start disable**

- Use the **no** version to restore the default, enable.

[25] Class

Use the following command to manage the Class RADIUS attribute.

- **radius include class**

radius include class

- Use to include the Class attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include class acct-start disable**

- Use the **no** version to restore the default, enable.

[30] Called-Station-Id

Use the following command to manage the Called-Station-Id RADIUS attribute.

- **radius include called-station-id**

radius include called-station-id

- Use to include the Called-Station-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Called-Station-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include called-station-id acct-start enable**

- Use the **no** version to restore the default, enable.

[31] Calling-Station-Id

Use the following commands to manage information for the Calling-Station-Id RADIUS attribute.

- **radius calling-station-format**
- **radius calling-station-delimiter**
- **radius include calling-station-id**
- **radius override calling-station-id remote-circuit-id**

radius calling-station-format

- Use to specify the format of the Calling-Station-Id [31] attribute on a virtual router.
- For each field in angle brackets (< >) in the Calling-Station-Id formats, the virtual router supplies the actual value for your configuration, unless otherwise specified.
- To specify that the RADIUS client use the delimited format when the PPP user is terminated at the non-LNS E-series router, use the **delimited** keyword.
  - Format for ATM interfaces:
    < delimiter > < system name > < delimiter > < *interface* > < delimiter > < VPI > < delimiter > < VCI > < delimiter >
  - Format for Ethernet interfaces:
    < delimiter > < system name > < delimiter > < *interface* > < delimiter > < VLAN >

  Where < *interface* > is one of the following items:

  - < port name > —The default setting
  - < VP description > —Appears if you use the **atm vp-description** command to assign a text description to an individual VP on an ATM interface
  - < VC description > —Appears if you use the **atm atm1483 description** command to assign a text description to VCs on an ATM 1483 subinterface and you use the **atm1483 export-subinterface-description** command to enable sending of VC interface descriptors to AAA
- To specify that the RADIUS client use a fixed format of up to 15 characters consisting of all ASCII fields, use the **fixed-format** keyword. The maximum number of characters for each field is shown in square brackets ([ ]).
  - Format for ATM interfaces:
    < system name [4] > < slot [2] > < port [1] > < VPI [3] > < VCI [5] >
  - Format for Ethernet interfaces:
    < system name [4] > < slot [2] > < port [1] > < VLAN [8] >
  - Format for serial interfaces:
    < system name [4] > < slot [2] > < port [1] > < 0 [8] >

    Where the final 8-byte field is always 0 (zero).
  - In the case of PPP terminated at the LNS, the Calling-Station-Id attribute is based on the received L2TP calling number AVP.

- To specify that the RADIUS client use a fixed format of up to 15 characters consisting of all ASCII fields with a 1-byte slot field, 1-byte adapter field, and 1-byte port field, use the **fixed-format-adapter-embedded** keyword. The maximum number of characters for each field is shown in square brackets ([ ]).

  - Format for ATM interfaces:
    <system name [4]> <slot [1]> <adapter [1]> <port [1]>
    <VPI [3]> <VCI [5]>
  - Format for Ethernet interfaces:
    <system name [4]> <slot [1]> <adapter [1]> <port [1]>
    <VLAN [8]>
  - Format for serial interfaces:
    <system name [4]> <slot [1]> <adapter [1]> <port [1]> <0 [8]>

    Where the final 8-byte field is always 0 (zero).

  - For E120 and E320 routers, <adapter> is the number of the bay in which the I/O adapter (IOA) resides, either 0 (representing the right IOA bay on the E120 router or the upper IOA bay on the E320 router) or 1 (representing the left IOA bay on the E120 router or the lower IOA bay on the E320 router). For ERX-7xx models, ERX-14xx models, and ERX-310 routers, <adapter> is always shown as 0 (zero).
  - Slot numbers 0 through 16 are shown as ASCII characters in the 1-byte slot field according to the following translation:

Slot Number	ASCII Character	Slot Number	ASCII Character
0	0	9	9
1	1	10	A
2	2	11	B
3	3	12	C
4	4	13	D
5	5	14	E
6	6	15	F
7	7	16	G
8	8	–	–

    For example, slot 16 is shown as the ASCII character uppercase G.

- To specify that the RADIUS client use a fixed format of up to 17 characters consisting of all ASCII fields with a 2-byte slot field, 1-byte adapter field, and 2-byte port field, use the **fixed-format-adapter-new-field** keyword. The maximum number of characters for each field is shown in square brackets ([ ]).

NOTE: You must use this command with the **fixed-format-adapter-new-field** keyword when you configure the format of the Calling-Station-ID attribute on routers that have line modules that support more than seven physical ports.

  - Format for ATM interfaces:
    <system name [4]> <slot [2]> <adapter [1]> <port [2]>
    <VPI [3]> <VCI [5]>
  - Format for Ethernet interfaces:
    <system name [4]> <slot [2]> <adapter [1]> <port [2]>
    <VLAN [8]>
  - Format for serial interfaces:
    <system name [4]> <slot [2]> <adapter [1]> <port [2]> <0 [8]>

    Where the final 8-byte field is always 0 (zero).
  - For E120 and E320 routers, <adapter> is the number of the bay in which the I/O adapter (IOA) resides, either 0 or 1. For ERX-7xx models, ERX-14xx models, and ERX-310 routers, <adapter> is always shown as 0 (zero).
  - Slot numbers 0 through 16 are shown as integers in the 2-byte slot field.
- Attribute 31, Calling-Station-Id, is used with Attribute 30, Called-Station-Id, in a standard way when the router is the LNS and the LAC is a dial-up LAC (not an E-series router). When the LNS receives the Calling-Station-Id and Called-Station-Id AVPs, the router includes the values as they are, with no format changes in the RADIUS messages.
- Example 1

  host1(config)#**radius calling-station-format fixed-format**

  For example, when you configure this Calling-Station-Id format on an E320 router for an ATM interface on slot 14, adapter 1, port 2, VCI 3, and VPI 4, the virtual router displays the format in ASCII as '14' '2' '003' '00004'. The adapter number does not appear in this format.

- Example 2

  host1(config)#**radius calling-station-format fixed-format-adapter-embedded**

  For example, when you configure this Calling-Station-Id format on an E320 router for an ATM interface on slot 14, adapter 1, port 2, VCI 3, and VPI 4, the virtual router displays the format in ASCII as 'E' '1' '2' '003' '00004'.

- Example 3

  host1(config)#**radius calling-station-format fixed-format-adapter-new-field**

  For example, when you configure this Calling-Station-Id format on an E320 router for an ATM interface on slot 14, adapter 1, port 2, VCI 3, and VPI 4, the virtual router displays the format in ASCII as '14' '1' '02' '003' '00004'.

- Use the **no** version to restore the default Calling-Station-Id format, **delimited**.

radius calling-station-delimiter

- Use to specify the Calling-Station-Id attribute's delimiter for DSL PPP users.
- The delimiter is one special character you select to set off items in the Calling-Station-Id's definition (for example, *#* or *%)*.

- Example

  host1(config)#**radius calling-station-delimiter &**

- Use the **no** version to remove the delimiter.

radius include calling-station-id

- Use to include the Calling-Station-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include calling-station-id acct-start disable**

- Use the **no** version to restore the default, enable.

radius override calling-station-id remote-circuit-id

- Use to configure RADIUS to override the standard use of the Calling-Station-Id attribute and instead use the remote circuit ID transmitted from a DSLAM device.
- Example

  host1(config)#**radius override calling-station-id remote-circuit-id**

- Use the **no** version to restore the default Calling-Station-ID value, which is the telephone number from which the call originated.

Related Topics

- Monitoring Override Settings of RADIUS IETF Attributes on page 246
- Monitoring the Calling-Station-Id RADIUS Attribute on page 247

[32] NAS-Identifier

Use the following commands to manage and display information for the NAS-Identifier RADIUS attribute.

- **radius nas-identifier**
- **radius include nas-identifier**
- **radius override nas-info**
- **radius remote-circuit-id-format**
- **radius remote-circuit-id-delimiter**

radius nas-identifier

- Use to set a value for the NAS-Identifier attribute. This value is used in the NAS-Identifier attribute for authentication and accounting requests.
- Example

  host1(config)#**radius nas-identifier fox**

- Use the **no** version to delete the NAS-Identifier.

radius include nas-identifier

- Use to include the NAS-Identifier attribute in Access-Request, Acct-Start, Acct-Stop, Acct-On, and Acct-Off messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include nas-identifier acct-start disable**

- Use the **no** version to restore the default, enable.

radius override nas-info

- Use in the correct virtual router context to override the standard use of NAS-IP-Address and NAS-Identifier attributes for AAA broadcast accounting; specifies that the attributes for the authentication virtual router be included in accounting packets instead of the attributes for the virtual router that generates the accounting information.
- Example

  host1(config)#**virtual-router vrXyz1**
  host1:vrXyz1(config)#**radius override nas-info**

- Use the **no** version to restore the standard use of the NAS-IP-Address and NAS-Identification attributes.

radius remote-circuit-id-format

- Use to configure the format of the PPPoE remote circuit ID value captured from a DSLAM.
- You can format the PPPoE remote circuit ID value to include either or both of the agent-circuit-ID (suboption 1) and agent-remote-id (suboption 2) suboptions of the DHCP relay agent information option (option 82) or the PPPoE intermediate agent tags.
- By default, the router formats the PPPoE remote circuit ID to include only the agent-circuit-id suboption.

- You can use this command to configure the following nondefault formats for the PPPoE remote circuit ID value:
  - Include either or both of the agent-circuit-id and agent-remote-id suboptions, with or without the NAS-Identifier [32] RADIUS attribute
  - Append the agent-circuit-id suboption value to an interface specifier that is consistent with the recommended format in the DSL Forum Technical Report (TR)-101—Migration to Ethernet-Based DSL Aggregation (April 2006).
- For more information about how to use this command, see *Using the PPPoE Remote Circuit ID to Identify Subscribers* and *Configuring PPPoE Remote Circuit ID Capture* in *JUNOSe Link Layer Configuration Guide, Chapter 10, Configuring Point-to-Point Protocol over Ethernet*.
- Examples

  host1(config)#**radius remote-circuit-id-format nas-identifier agent-circuit-id agent-remote-id**

  host1(config)#**radius remote-circuit-id-format dsl-forum-1**

- Use the **no** version to restore the default format, agent-circuit-id.

radius remote-circuit-id-delimiter

- Use to configure the delimiter character that the router uses to set off multiple components in the format of the PPPoE remote circuit ID value captured from a DSLAM.
- For information about how to use this command, see *Configuring PPPoE Remote Circuit ID Capture* in *JUNOSe Link Layer Configuration Guide, Chapter 10, Configuring Point-to-Point Protocol over Ethernet*.
- Example

  host1(config)#**radius remote-circuit-id-delimiter !**

- Use the **no** version to restore the default delimiter character, #.

Related Topics

- Monitoring Override Settings of RADIUS IETF Attributes on page 246
- Monitoring the NAS-Identifier RADIUS Attribute on page 248
- Monitoring the Format of the Remote-Circuit-ID for RADIUS on page 248
- Monitoring the Delimiter Character in the Remote-Circuit-ID for RADIUS on page 248

[41] Acct-Delay-Time

Use the following commands to manage and display information for the Acct-Delay-Timer RADIUS attribute.

- **radius include acct-delay-time**

radius include acct-delay-time

- Use to include the Acct-Delay-Time attribute in Acct-On or Acct-Off messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-delay-time acct-on enable**

- Use the **no** version to restore the default, enable.

[44] Acct-Session-Id

Use the following commands to manage and display information for the Acct-Session-Id RADIUS attribute.

- **radius include acct-session-id**
- **radius acct-session-id-format**

radius include acct-session-id

- Use to include the Acct-Session-Id attribute in Access-Request, Acct-On, or Acct-Off messages.
- You can control inclusion of the Acct-Session-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-session-id access-request disable**

- Use the **no** version to restore the default, enable.

radius acct-session-id-format

- Use to set the Acct-Session-Id attribute format. Two formats are supported:
  - **description**—Configures RADIUS client to use the generic format: erx < interface identifier > : < hex number > . For example: **erx atm 12/1:0.3:0000ef1**
  - **decimal**—Configures the RADIUS client to use a decimal format. For example: **435264**
- Example

  host1(config)#**radius acct-session-id-format decimal**

- Use the **no** version to negate the Acct-Session-Id format.

[45] Acct-Authentic

Use the following command to manage the Acct-Authentic RADIUS attribute.

- **radius include acct-authentic**

radius include acct-authentic

- Use to include the Acct-Authentic attribute in Acct-On or Acct-Off messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-authentic acct-on enable**

- Use the **no** version to restore the default, enable.

[49] Acct-Terminate-Cause

Use the following command to manage the Acct-Terminate-Cause RADIUS attribute.

- **radius include acct-terminate-cause**

radius include acct-terminate-cause

- Use to include the Acct-Terminate-Cause attribute in Acct-Off messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-terminate-cause acct-off disable**

- Use the **no** version to restore the default, enable.

[50] Acct-Multi-Session-Id

Use the following command to manage the Acct-Multi-Session-Id RADIUS attribute.

- **radius include acct-multi-session-id**

radius include acct-multi-session-id

- Use to include the Acct-Multi-Session-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Acct-Multi-Session-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-multi-session-id acct-stop disable**

- Use the **no** version to restore the default, enable for accounting messages and disable for access requests.

[51] Acct-Link-Count

Use the following command to manage the Acct-Link-Count RADIUS attribute.

- **radius include acct-link-count**

radius include acct-link-count

- Use to include the Acct-Link-Count attribute in Acct-Start and Acct-Stop messages.
- You can control inclusion of the Acct-Input-Gigawords attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-link-count acct-stop disable**

- Use the **no** version to restore the default, enable.

[52] Acct-Input-Gigawords

Use the following command to manage the Acct-Input-Gigawords RADIUS attribute.

- **radius include input-gigawords**

radius include input-gigawords

- Use to include the Acct-Input-Gigawords attribute in Acct-Stop messages.
- You can control inclusion of the Acct-Input-Gigawords attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include input-gigawords acct-stop disable**

- Use the **no** version to restore the default, enable.

[53] Output-Gigawords

Use the following command to manage the Acct-Output-Gigawords RADIUS attribute.

- **radius include output-gigawords**

radius include output-gigawords

- Use to include the Acct-Output-Gigawords attribute in Acct-Stop messages.
- You can control inclusion of the Acct-Output-Gigawords attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include output-gigawords acct-stop enable**

- Use the **no** version to restore the default, enable.

[55] Event-Timestamp

Use the following command to manage the Acct-Output-Gigawords RADIUS attribute.

- **radius include event-timestamp**

radius include event-timestamp

- Use to include the Event-Timestamp attribute in Acct-Start, Acct-Stop, Acct-On, or Acct-Off messages.
- You can control inclusion of the Event-Timestamp attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include event-timestamp acct-on enable**

- Use the **no** version to restore the default, enable.

[61] NAS-Port-Type

Use the following commands to manage and display information for the NAS-Port-Type RADIUS attribute.

- **radius dsl-port-type**
- **radius ethernet-port-type**
- **radius include nas-port-type**

radius dsl-port-type

- Use to configure the NAS-Port-Type attribute for the DSL port type.
- This attribute can have several values. If the interface (port) is DSL, then the attribute can have any value listed in the command and uses the value configured. If the interface (port) is Ethernet, then it sets the attribute to Ethernet and disregards the parameter set with this command. Options include:
  - **adsl-cap**—Asymmetric DSL, carrierless amplitude phase (CAP) modulation
  - **adsl-dmt**—Asymmetric DSL, discrete multitone (DMT)
  - **idsl**—ISDN DSL
  - **sdsl**—Symmetric DSL
  - **virtual**—Virtual
  - **xdsl**—DSL of unknown type
- Example

  host1(config)#**radius dsl-port-type xdsl**

- Use the **no** version to restore the default, xdsl.

radius ethernet-port-type

- Use to set the NAS-Port-Type attribute for Ethernet interfaces to **ethernet** or **virtual**.
- Example

  host1(config)#**radius ethernet-port-type virtual**

- Use the **no** version to restore the default, ethernet.

radius include nas-port-type

- Use to include the NAS-Port-Type attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include nas-port-type acct-start enable**

- Use the **no** version to restore the default, enable.

Related Topics

- Monitoring the DSL-Port-Type RADIUS Attribute on page 249

[64] Tunnel-Type

Use the following command to manage the Tunnel-Type RADIUS attribute.

- **radius include tunnel-type**

radius include tunnel-type

- Use to include the Tunnel-Type attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the Tunnel-Type attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-type access-request enable**

- Use the **no** version to restore the default, enable.

[65] Tunnel-Medium-Type

Use the following command to manage the Tunnel-Type-Medium RADIUS attribute.

- **radius include tunnel-medium-type**

radius include tunnel-medium-type

- Use to include the Tunnel-Medium-Type attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the Tunnel-Medium-Type attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-medium-type acct-start enable**

- Use the **no** version to restore the default, enable.

[66] Tunnel-Client-Endpoint

Use the following command to manage the Tunnel-Client-Endpoint RADIUS attribute.

- **radius include tunnel-client-endpoint**

radius include tunnel-client-endpoint

- Use to include the Tunnel-Client-Endpoint attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the Tunnel-Client-Endpoint attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-client-endpoint acct-start enable**

- Use the **no** version to restore the default, enable.

[67] Tunnel-Server-Endpoint

Use the following command to manage the Tunnel-Server-Endpoint RADIUS attribute.

- **radius include tunnel-server-endpoint**

radius include tunnel-server-endpoint

- Use to include the Tunnel-Server-Endpoint attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the Tunnel-Server-Endpoint attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-server-endpoint acct-stop disable**

- Use the **no** version to restore the default, enable.

[68] Acct-Tunnel-Connection

Use the following command to manage the Acct-Tunnel-Connection RADIUS attribute.

- **radius include acct-tunnel-connection**

radius include acct-tunnel-connection

- Use to include the Acct-Tunnel-Connection attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Acct-Tunnel-Connection attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include acct-tunnel-connection acct-stop enable**

- Use the **no** version to restore the default, enable.

[77] Connect-Info

Use the following commands to manage and display information for the Connect-Info RADIUS attribute.

- **radius connect-info-format l2tp-connect-speed**
- **radius include connect-info**

radius connect-info-format

- Use on the LNS to enable the generation of the RADIUS Connect-Info attribute and to specify the attribute's format. The attribute is based on the L2TP connect-speed AVPs for received (RX) speed (AVP 38) and transmit (TX) speed (AVP 24). See *Configuring the RX Speed on the LAC* in *Chapter 12, Configuring an L2TP LAC* for information about generating the RX and TX speed AVPs.
- The Connect-Info attribute is a string in the following format; the attribute is generated whenever the TX speed is not zero.

  tx-speed [/rx-speed]

- The TX speed is always included in the attribute when the speed is not zero; however, inclusion of the RX speed depends on the keyword you use with the command.
  - Use the **l2tp-connect-speed** keyword to specify that the RX speed is only included when it is not zero and differs from the TX speed.
  - Example

    host1(config)#**radius connect-info-format l2tp-connect-speed**

- Use the **l2tp-connect-speed-rx-when-equal** keyword to specify that the RX speed is always included when it is not zero.
- Example

  host1(config)#**radius connect-info-format l2tp-connect-speed-rx-when-equal**

- Use the **no** version to disable the inclusion of the RX speed when it is the same as the TX speed.

radius include connect-info

- Use to include the Connect-Info attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Connect-Info attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include connect-info access-request disable**

- Use the **no** version to restore the default, enable.

Related Topics

- Monitoring the Connect-Info RADIUS Attribute on page 249

[82] Tunnel-Assignment-Id

Use the following command to manage the Tunnel-Assignment-Id RADIUS attribute.

- **radius include tunnel-assignment-id**

radius include tunnel-assignment-id

- Use to include the Tunnel-Assignment-Id attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the Tunnel-Assignment-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-assignment-id acct-stop enable**

- Use the **no** version to restore the default, enable.

[83] Tunnel-Preference

Use the following command to manage the Tunnel-Preference RADIUS attribute.

- **radius include tunnel-preference**

radius include tunnel-preference

- Use to include the Tunnel-Preference attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the Tunnel-Preference attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-preference acct-start enable**

- Use the **no** version to restore the default, enable.

[87] NAS-Port-Id

Use the following commands to manage and show information for the NAS-Port-Id RADIUS attribute.

- **aaa intf-desc-format include**
- **radius include nas-port-id**
- **radius override nas-port-id remote-circuit-id**

aaa intf-desc-format include

- Use to specify whether the router includes the subinterface number or adapter in the interface description it passes to RADIUS for inclusion in the NAS-Port-Id attribute. By default, the subinterface and adapter are sent (the commands are enabled).
- Examples

  host1#**aaa intf-desc-format include sub-intf disable**
  host1#**aaa intf-desc-format include adapter enable**

- Use the **no** version to remove the configuration.

radius include nas-port-id

- Use to include the NAS-Port-Id attribute in the Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the NAS-Port-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include nas-port-id access-request enable**

- Use the **no** version to restore the default, enable.

radius override nas-port-id remote-circuit-id

- Use to configure RADIUS to override the standard use of the NAS-Port-Id attribute and instead use the remote circuit ID transmitted from a DSLAM device.
- Example

  host1(config)#**radius override nas-port-id remote-circuit-id**

- Use the **no** version to restore the default NAS-Port-ID value, which is the physical interface of the NAS that is authenticating the user.

Related Topics

- Monitoring Override Settings of RADIUS IETF Attributes on page 246
- Monitoring the NAS-Port-ID RADIUS Attribute on page 249

[90] Tunnel-Client-Auth-Id

Use the following command to manage the Tunnel-Client-Auth-Id RADIUS attribute.

- **radius include tunnel-client-auth-id**

radius include tunnel-client-auth-id

- Use to include the Tunnel-Client-Auth-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Tunnel-Client-Auth-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-client-auth-id access-request disable**

- Use the **no** version to restore the default, enable.

[91] Tunnel-Server-Auth-Id

Use the following command to manage the Tunnel-Server-Auth-Id RADIUS attribute.

- **radius include tunnel-server-auth-id**

radius include tunnel-server-auth-id

- Use to include the Tunnel-Server-Auth-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Tunnel-Server-Auth-Id attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-server-auth-id acct-start enable**

- Use the **no** version to restore the default, enable.

[96] Framed-Interface-Id

Use the following command to manage the Framed-Interface-Id RADIUS attribute.

- **radius include framed-interface-id**

radius include framed-interface-id

- Use to include the Framed-Interface-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Framed-Interface-Id attribute by enabling or disabling this command.
- For RADIUS to include this attribute, an IPv6 interface ID must be assigned to the subscriber.
- Example

  host1(config)#**radius include framed-interface-id acct-start enable**

- Use the **no** version to restore the default, disable.

[97] Framed-Ipv6-Prefix

Use the following command to manage the Framed-Ipv6-Prefix RADIUS attribute.

- **radius include framed-ipv6-prefix**

radius include framed-ipv6-prefix

- Use to include the Framed-Ipv6-Prefix attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Framed-Ipv6-Prefix attribute by enabling or disabling this command.
- For RADIUS to include this attribute, at least one IPv6 prefix must be assigned to the subscriber.
- Example

  host1(config)#**radius include framed-ipv6-prefix acct-start enable**

- Use the **no** version to restore the default, disable.

[188] Ascend-Num-In-Multilink

Use the following command to manage the Ascend-Num-In-Multilink attribute.

- **radius include ascend-num-in-multilink**

radius include ascend-num-in-multilink

- Use to include the Ascend-Num-In-Multilink attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Ascend-Num-In-Multilink attribute by enabling or disabling this command.

- Example

  host1(config)#**radius include ascend-num-in-multilink acct-start enable**

- Use the **no** version to restore the default, disable.

All Tunnel Server Attributes

Use the following command to manage all tunnel server RADIUS attributes.

- **radius include tunnel-server-attributes**

radius include tunnel-server-attributes

- Use to include all supported tunnel server attributes in Access-Request, Acct-Start, or Acct-Stop messages.
- When the router functions as an LNS with a terminating PPP, then the LAC tunnel attributes are included.
- You can control inclusion of all tunnel server attributes by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-server-attributes access-request enable**

- Use the **no** version to restore the default, disable.

Juniper Networks Vendor-Specific Attributes

This section describes the Juniper Networks vendor-specific attributes (VSAs) that you can configure using CLI commands. The attributes are listed numerically and are followed by descriptions about the commands that you can use to manage the attribute.

[26-1] Virtual-Router

Use the following command to manage the Virtual-Router RADIUS attribute.

- **radius ignore virtual-router**

radius ignore virtual-router

- Use to cause the Virtual-Router attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- Example

  host1(config)#**radius ignore virtual-router enable**

- Use the **no** version to restore the default, disable.

[26-10] Ingress-Policy-Name

Use the following commands to manage the Ingress-Policy-Name RADIUS attribute.

- **radius include ingress-policy-name**
- **radius ignore ingress-policy-name**

radius include ingress-policy-name

- Use to include the Ingress-Policy-Name attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include ingress-policy-name acct-start enable**

- Use the **no** version to restore the default.

radius ignore ingress-policy-name

- Use to cause the Ingress-Policy-Name attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command. The default is **disable**.
- Example

  host1(config)#**radius ignore ingress-policy-name enable**

- Use the **no** version to restore the default, enable.

[26-11] Egress-Policy-Name

Use the following commands to manage the Egress-Policy-Name RADIUS attribute.

- **radius include egress-policy-name**
- **radius ignore egress-policy-name**

radius include egress-policy-name

- Use to include the Egress-Policy-Name attribute in Acct-Start or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include egress-policy-name acct-start enable**

- Use the **no** version to restore the default, enable.

radius ignore egress-policy-name

- Use to cause the Egress-Policy-Name attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- Example

  host1(config)#**radius ignore egress-policy-name enable**

- Use the **no** version to restore the default, disable.

[26-14] Service-Category

Use the following command to manage the Service-Category RADIUS attribute.

- **radius ignore atm-service-category**

radius ignore atm-service-category

- Use to cause the Service-Category attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- Example

  host1(config)#**radius ignore atm-service-category enable**

- Use the **no** version to restore the default, disable.

[26-15] PCR

Use the following command to manage the PCR RADIUS attribute.

- **radius ignore atm-pcr**

radius ignore atm-pcr

- Use to cause the PCR attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- Example

  host1(config)#**radius ignore atm-pcr enable**

- Use the **no** version to restore the default, disable.

[26-16] SCR

Use the following command to manage the SCR RADIUS attribute.

- **radius ignore atm-scr**

radius ignore atm-scr

- Use to cause the SCR attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- Example

  host1(config)#**radius ignore atm-scr enable**

- Use the **no** version to restore the default, disable.

[26-17] MBS

Use the following command to manage the MBS RADIUS attribute.

- **radius ignore atm-mbs**

radius ignore atm-mbs

- Use to cause the MBS attribute to be ignored in Access-Accept messages.
- You can control this behavior by enabling or disabling this command.
- Example

  host1(config)#**radius ignore atm-mbs enable**

- Use the **no** version to restore the default, disable.

[26-24] Pppoe-Description

Use the following command to manage the Pppoe-Description RADIUS attribute.

- **radius include pppoe-description**

radius include pppoe-description

- Use to include the Pppoe-Description attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the Pppoe-Description attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include pppoe-description acct-start enable**

- Use the **no** version to restore the default, enable.

[26-35] Acct-Input-Gigapackets

Use the following command to manage the Acct-Input-Gigapackets RADIUS attribute.

- **radius include input-gigapkts**

radius include input-gigapkts

- Use to include Acct-Input-Gigapackets in Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include input-gigapkts acct-stop disable**

- Use the **no** version to restore the default, enable.

[26-36] Acct-Output-Gigapackets

Use the following command to manage the Acct-Output-Gigapackets RADIUS attribute.

- **radius include output-gigapkts**

radius include output-gigapkts

- Use to include the Acct-Output-Gigapackets attribute in Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include output-gigapkts acct-stop disable**

- Use the **no** version to restore the default, enable.

[26-44] Tunnel-Interface-Id

Use the following command to manage the Tunnel-Interface-Id RADIUS attribute.

- **radius include tunnel-interface-id**

radius include tunnel-interface-id

- Use to include the Tunnel-Interface-Id attribute in Access-Request, Acct-Start, or Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include tunnel-interface-id enable**

- Use the **no** version to restore the default, disable.

[26-51] Disconnect-Cause

Use the following command to manage the Disconnect-Cause RADIUS attribute.

- **radius include l2tp-ppp-disconnect-cause**

radius include l2tp-ppp-disconnect-cause

- Use to include the Disconnect-Cause attribute in Acct-Stop and Acct-Tunnel-Link-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include l2tp-ppp-disconnect-cause acct-stop-enable**

- Use the **no** version to restore the default, disable.

[26-53] Service-Description

Use the following command to manage the Service-Description RADIUS attribute.

- **radius include profile-service-description**

radius include profile-service-description

- Use to include the Service-Description attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include profile-service-description acct-stop enable**

- Use the **no** version to restore the default, disable.

[26-55] DHCP-Options

Use the following command to manage the DHCP-Options RADIUS attribute.

- **radius include dhcp-options**

radius include dhcp-options

- Use to include the DHCP-Options attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include dhcp-options acct-stop enable**

- Use the **no** version to restore the default, disable.

[26-56] DHCP-MAC-Address

Use the following command to manage the DHCP-MAC-Address RADIUS attribute.

- **radius include dhcp-mac-address**

radius include dhcp-mac-address

- Use to include the DHCP-MAC-Address attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include dhcp-mac-address acct-stop enable**

- Use the **no** version to restore the default, disable.

[26-57] DHCP-GI-Address

Use the following command to manage the DHCP-GI-Address RADIUS attribute.

- **radius include dhcp-gi-address**

radius include dhcp-gi-address

- Use to include the DHCP-GI-Address attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the attribute by enabling or disabling this command.
- Example

  host1(config)#**radius include dhcp-gi-address acct-stop enable**

- Use the **no** version to restore the default, disable.

[26-62] MLPPP-Bundle-Name

Use the following command to manage the MLPPP-Bundle-Name RADIUS attribute.

- **radius include mlppp-bundle-name**

radius include mlppp-bundle-name

- Use to include the MLPPP-Bundle-Name attribute in Access-Request, Acct-Start, Interim-Acct, or Acct-Stop messages.
- You can control inclusion of the MLPPP-Bundle-Name attribute by enabling or disabling this command.
- There is no explicit command to include the MLPPP-Bundle-Name attribute in Interim-Acct messages; however, the attribute is automatically included in Interim-Acct messages when the attribute is enabled for Acct-Stop messages.

- Example

  host1(config)#**radius include mlppp-bundle-name acct-start enable**

- Use the **no** version to restore the default, disable.

[26-63] Interface-Desc

Use the following command to manage the Interface-Desc RADIUS attribute.

- **radius include interface-description**

radius include interface-description

- Use to include the Interface-Desc attribute, with the subscriber's access interface description, in Access-Request, Acct-Start, Interim-Acct, or Acct-Stop messages.
- You can control inclusion of the Interface-Desc attribute by enabling or disabling this command. Inclusion is disabled by default.
- There is no explicit command to include the Interface-Desc attribute in Interim-Acct messages; however, the attribute is automatically included in Interim-Acct messages when the attribute is enabled for Acct-Stop messages.
- Example

  host1(config)#**radius include interface-description acct-start enable**

- Use the **no** version to restore the default, disable.

[26-81] L2C-Information

Use the following command to manage the L2C-Information RADIUS attribute.

- **radius include access-loop-parameters**

radius include access-loop-parameters

- Use to include the L2C-Information attribute in Access-Request messages.
- You can control inclusion of the L2C-Information attribute by enabling or disabling this command. Inclusion is disabled by default.
- Example

  host1(config)#**radius include access-loop-parameters access-request enable**

- Use the **no** version to restore the default, disable.

[26-92] L2C-Up-Stream-Data

Use the following command to manage the L2C-Up-Stream-Data RADIUS attribute.

- **radius include l2c-upstream-data**

radius include l2c-upstream-data

- Use to include the L2C-Up-Stream-Data attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the L2C-Up-Stream-Data attribute by enabling or disabling this command. Inclusion is disabled by default.
- Example

  host1(config)#**radius include l2c-upstream-data access-request enable**

- Use the **no** version to restore the default, disable.

[26-93] L2C-Down-Stream-Data

Use the following command to manage the L2C-Down-Stream-Data RADIUS attribute.

- **radius include l2c-downstream-data**

radius include l2c-downstream-data

- Use to include the L2C-Down-Stream-Data attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the L2C-Down-Stream-Data attribute by enabling or disabling this command. Inclusion is disabled by default.
- Example

  host1(config)#**radius include l2c-downstream-data access-request enable**

- Use the **no** version to restore the default, disable.

[26-141] Downstream-Calculated-Qos-Rate

The Downstream-Calculated-Qos-Rate RADIUS attribute enables RADIUS to receive calculated QoS rates from ANCP.

Use the following command to manage the Downstream-Calculated-Qos-Rate RADIUS attribute.

- **radius include downstream-calculated-qos-rate access-request**
- **radius include downstream calculated-qos-rate acct-start**
- **radius include downstream-calculated-qos-rate acct-stop**

radius include downstream-calculated-qos-rate

- Use to include the Downstream-Calculated-Qos-Rate attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the Downstream-Calculated-Qos-Rate attribute by enabling or disabling this command. Inclusion is disabled by default.

- Example

  host1(config)#**radius include downstream-calculated-qos-rate access-request enable**

- Use the **no** version to restore the default, disable.

[26-142] Upstream-Calculated-Qos-Rate

The Upstream-Calculated-Qos-Rate RADIUS attribute enables RADIUS to receive calculated QoS rates from ANCP.

Use the following commands to manage the Upstream-Calculated-Qos-Rate RADIUS attribute.

- **radius include upstream-calculated-qos-rate access-request**
- **radius include upstream calculated-qos-rate acct-start**
- **radius include upstream-calculated-qos-rate acct-stop**

radius include upstream-calculated-qos-rate

- Use to include the Upstream-Calculated-Qos-Rate attribute in Access-Request, Acct-Start, and Acct-Stop messages.
- You can control inclusion of the Upstream-Calculated-Qos-Rate attribute by enabling or disabling this command. Inclusion is disabled by default.
- Example

  host1(config)#**radius include upstream-calculated-qos-rate access-request enable**

- Use the **no** version to restore the default, disable.

ANCP-Related Juniper Networks VSAs

You use the **radius include** command to specify information about Access Node Control Protocol (ANCP), also known as Layer 2 Control (L2C), that you want to include in the RADIUS Access-Request, Acct-Start, and Acct-Stop messages. Also, if you specify Acct-Stop messages, the router includes ANCP information in Interim-Acct messages that the router sends to RADIUS. By default, the router does not include the ANCP-related information provided by the Juniper Networks VSAs in RADIUS messages.

These Juniper Networks ANCP-related VSAs are based on definitions in GSMP extensions for layer2 control (L2C) Topology Discovery and Line Configuration—draft-wadhwa-gsmp-l2control-configuration-00.txt (July 2006 expiration).

radius include l2cd-keyword

- Use to include ANCP-related Juniper Networks VSAs in Access-Request, Acct-Start, and Acct-Stop messages that the router sends to RADIUS. If you enable inclusion of the ANCP-related VSAs in Acct-Stop messages, the router also includes the VSAs in Interim-Acct messages. Inclusion is disabled by default.
- You must enable ANCP discovery with the **discovery-mode** command prior to configuring the **radius include** command with the ANCP-related VSAs. Configuring discovery mode enables the RADIUS authentication server to retrieve ANCP information.
- Table 41 lists the ANCP (L2C)-related keywords that you can use in the **radius include** command and the associated Juniper Networks VSAs. The table also indicates the mappings between ANCP parameters and the VSAs.

Table 41: ANCP (L2C)-Related Keywords for radius include Command

Command Keyword	Juniper Networks VSA Number	Juniper Networks VSA Name	ANCP Type	ANCP Subtype
l2cd-acc-loop-cir-id	[26-110]	Acc-Loop-Cir-Id	1	–
l2cd-acc-aggr-cir-id-bin	[26-111]	Acc-Aggr-Cir-Id-Bin	2	–
l2cd-acc-aggr-cir-id-asc	[26-112]	Acc-Aggr-Cir-Id-Asc	3	–
l2cd-act-data-rate-up	[26-113]	Act-Data-Rate-Up	4	129
l2cd-act-data-rate-dn	[26-114]	Act-Data-Rate-Dn	4	130
l2cd-min-data-rate-up	[26-115]	Min-Data-Rate-Up	4	131
l2cd-min-data-rate-dn	[26-116]	Min-Data-Rate-Dn	4	132
l2cd-att-data-rate-up	[26-117]	Att-Data-Rate-Up	4	133
l2cd-att-data-rate-dn	[26-118]	Att-Data-Rate-Dn	4	134
l2cd-max-data-rate-up	[26-119]	Max-Data-Rate-Up	4	135
l2cd-max-data-rate-dn	[26-120]	Max-Data-Rate-Dn	4	136
l2cd-min-lp-data-rate-up	[26-121]	Min-LP-Data-Rate-Up	4	137
l2cd-min-lp-data-rate-dn	[26-122]	Min-LP-Data-Rate-Dn	4	138
l2cd-max-interlv-delay-up	[26-123]	Max-Interlv-Delay-Up	4	139
l2cd-act-interlv-delay-up	[26-124]	Act-Interlv-Delay-Up	4	140
l2cd-max-interlv-delay-dn	[26-125]	Max-Interlv-Delay-Dn	4	141
l2cd-act-interlv-delay-dn	[26-126]	Act-Interlv-Delay-Dn	4	142
l2cd-dsl-line-state	[26-127]	DSL-Line-State	4	143
l2cd-dsl-type	[26-128]	DSL-Type	4	144

- Example

  host1(config)#**radius include l2cd-acc-loop-cir-id acct-start enable**

- Use the **no** version to restore the default behavior, disable.

NOTE: JUNOSe software continues to support DSL Forum VSAs (vendor ID 3561) that you can use to include DSL-related information in RADIUS messages. See *DSL Forum Vendor-Specific Attributes* on page 189.

Related Topics

- To display a list of attributes that are included in RADIUS messages, see *Monitoring Included RADIUS Attributes* on page 250

DSL Forum Vendor-Specific Attributes

You can use the **radius include dsl-forum-attributes** command to control the inclusion of a set of DSL Forum VSAs in Access-Request, Acct-Start, Acct-Stop, and (if Acct-Stop messages are specified) Interim-Acct messages that the router sends to RADIUS.

The DSL Forum VSAs, as defined in RFC 4679—DSL Forum Vendor-Specific RADIUS Attributes (September 2006), convey information about the associated subscriber for and data rate of the DSL. A service provider might find it useful to enable inclusion of the DSL Forum VSAs in RADIUS messages in order to bill subscribers for different classes of service based on the data rate of their DSL connection.

NOTE: JUNOSe software also supports several Juniper Networks VSAs that you can use to include DSL-related information. See *ANCP-Related Juniper Networks VSAs* on page 187 and *Juniper Networks VSAs* in *Chapter 6, RADIUS Attribute Descriptions*.

The router receives data containing one or more of the DSL Forum VSAs from a DSLAM connected to the router via a PPPoE interface. When you enable the inclusion of the DSL Forum VSAs in these RADIUS messages, the router includes all of the following attributes in the specified message type, provided that the VSA is available in the information that the router receives from the DSLAM.

NOTE: The router uses the vendor ID assigned to the DSL Forum (3561, or DE9 in hexadecimal format) by the Internet Assigned Numbers Authority (IANA) for the DSL Forum VSAs.

Agent-Circuit-Id [26-1]	Maximum-Data-Rate-Downstream [26-136]
Agent-Remote-Id [26-2]	Minimum-Data-Rate-Upstream-Low-Power [26-137]
Actual-Data-Rate-Upstream [26-129]	Minimum-Data-Rate-Downstream-Low-Power [26-138]
Actual-Data-Rate-Downstream [26-130]	Maximum-Interleaving-Delay-Upstream [26-139]
Minimum-Data-Rate-Upstream [26-131]	Actual-Interleaving-Delay-Upstream [26-140]

Minimum-Data-Rate-Downstream [26-132]	Maximum-Interleaving-Delay-Downstream [26-141]
Attainable-Data-Rate-Upstream [26-133]	Actual-Interleaving-Delay-Downstream [26-142]
Attainable-Data-Rate-Downstream [26-134]	Access-Loop-Encapsulation [26-144]
Maximum-Data-Rate-Upstream [26-135]	IWF-Session [26-254]

For information about enabling the QoS downstream rate application to obtain downstream rates from the Actual-Data-Rate-Downstream [26-130] DSL Forum VSA, see *JUNOSe Quality of Service Configuration Guide, Chapter 29, Configuring the Downstream Rate Using QoS Parameters*.

For a more detailed description of the DSL Forum VSAs, see *DSL Forum VSAs* in *Chapter 6, RADIUS Attribute Descriptions*.

radius include dsl-forum-attributes

- Use to include the set of DSL Forum VSAs in Access-Request, Acct-Start, and Acct-Stop messages that the router sends to RADIUS. If you enable inclusion of the DSL Forum VSAs in Acct-Stop messages, the router also includes the VSAs in Interim-Acct messages.
- You can control inclusion of the DSL Forum VSAs in the specified message type by enabling or disabling this command. Inclusion is disabled by default.
- When you enable inclusion of the DSL Forum VSAs for a specified message type, the router includes in that message all of the DSL Forum attributes that it receives from the DSLAM.
- Example

  host1(config)#**radius include dsl-forum-attributes access-request enable**

- Use the **no** version to restore the default behavior, disable.

Including or Excluding Attributes in RADIUS Messages

For many attributes, you can configure the router to include or exclude the attribute in RADIUS messages.

radius include

- Use to enable or disable the inclusion of RADIUS attributes in Acct-On, Acct-Off, Access-Request, Acct-Start, and Acct-Stop messages.
- Examples

  host1(config)#**radius include ingress-policy-name acct-start enable**

  host1(config)#**radius include tunnel-type access-request disable**

- Use the **no** version to restore the default, disable.

Related Topics

- To see a list of the attributes that you can include or exclude, see *Monitoring Included RADIUS Attributes* on page 250

Ignoring Attributes When Receiving Access-Accept Messages

You can configure the router to ignore or use many attributes that it receives in Access-Accept messages.

radius ignore

- Use to specify that a RADIUS attribute be ignored or be accepted from Access-Accept messages.
- Use the **enable** keyword to specify that the RADIUS client ignore the attribute from the RADIUS server or the **disable** keyword to use the attribute.
- Examples

  host1(config)#**radius ignore atm-scr enable**

  host1(config)#**radius ignore framed-ip-netmask disable**

- Use the **no** version to restore the default, enable.

Related Topics

- To see the list of attributes that the router uses or ignores, see *Monitoring Ignored RADIUS Attributes* on page 251

Chapter 4

Configuring RADIUS Dynamic-Request Server

This chapter describes the RADIUS dynamic-request server feature on E-series routers. The following topics describe this feature:

Overview

The E-series router's RADIUS dynamic-request server feature provides an efficient way for you to use RADIUS servers to centrally manage user sessions. The RADIUS dynamic-request server enables the router to receive the following types of messages from RADIUS servers:

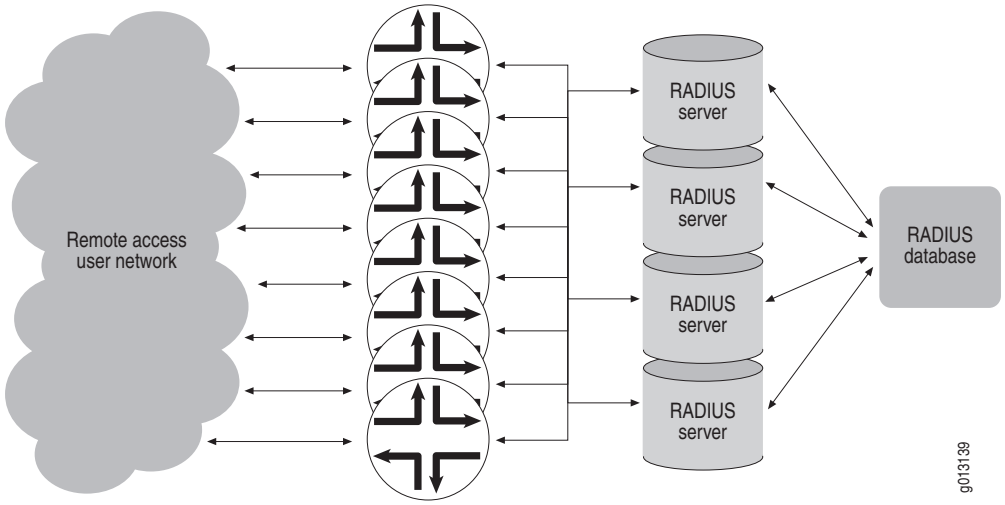
- Disconnect messages—Immediately terminate specific user sessions.
- Change-of-Authorization (CoA) messages—Dynamically modify session authorization attributes, such as data filters.

NOTE: The RADIUS dynamic-request server's support for CoA messages is used by the Service Manager and by the E-series router's packet mirroring feature. For information about using the Service Manager, see *Chapter 27, Configuring Service Manager* in this guide. For specific information about using the dynamic-request server with packet mirroring, see *Configuring RADIUS-Based Mirroring* in *JUNOSe Policy Management Configuration Guide, Chapter 12, Configuring RADIUS-Based Mirroring*

For example, you might use the RADIUS dynamic-request server to terminate specific user sessions. Without the RADIUS dynamic-request server, the only way to disconnect a RADIUS user is from the E-series router. This disconnect method is cumbersome when a network has many systems. The RADIUS dynamic-request server allows RADIUS servers to initiate user-related operations, such as a termination operation, by sending unsolicited request messages to an E-series router.

Figure 5 shows a network that would benefit from the RADIUS dynamic-request server functionality. In Figure 5, instead of disconnecting users on each E-series router, the RADIUS servers can initiate the disconnection. Although the network has multiple RADIUS servers, the servers share a common database that contains authorization and accounting information. Having a common database allows any server to view who is currently valid and connected, and allows service providers to manage the disconnection of users.

Figure 5: Sample Remote Access Network Using RADIUS



Platform Considerations

RADIUS dynamic-request server is supported on all E-series routers. For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about the RADIUS dynamic-request server feature, see the following references:

- RFC 2865—Remote Authentication Dial In User Service (RADIUS) (June 2000)
- RFC 2866—RADIUS Accounting (June 2000)
- RFC 3576—Dynamic Authorization Extensions to Remote Authentication Dial In User Service (RADIUS) (July 2003)

How RADIUS Dynamic-Request Server Works

In a typical client-server RADIUS environment, the E-series router functions as the client and the RADIUS server functions as the server. However, when using the RADIUS dynamic-request server feature, the roles are reversed. For example, during a RADIUS-initiated disconnect operation, the E-series router's RADIUS dynamic-request server functions as the server, and the RADIUS server functions as the disconnect client.

RADIUS-Initiated Disconnect

This section describes the RADIUS dynamic-request server's RADIUS-initiated disconnect feature.

Disconnect Messages

To centrally control the disconnection of remote access users, the RADIUS dynamic-request server on the router must receive and process unsolicited messages from RADIUS servers.

The RADIUS-initiated disconnect feature uses the existing format of RADIUS disconnect request and response messages. The RADIUS-initiated disconnect feature uses the following codes in its RADIUS request and response messages:

- Disconnect-Request (40)
- Disconnect-ACK (41)
- Disconnect-NAK (42)

Message Exchange

The RADIUS server and the router's RADIUS dynamic-request server exchange messages using User Datagram Protocol (UDP). The Disconnect-Request message sent by the RADIUS server has the same format as the CoA-Request packet that is sent for a change of authorization operation.

The disconnect response is either a Disconnect-ACK or a Disconnect-NAK message:

- If AAA successfully disconnects the user, the response is a RADIUS-formatted packet with a Disconnect-ACK message.
- If AAA cannot disconnect the user, the request is malformed, or attributes are missing from the request, the response is a RADIUS-formatted packet with a Disconnect-NAK message.

Supported Error-Cause Codes (RADIUS Attribute 101)

When a disconnect request fails, the RADIUS dynamic-request server includes an error-cause attribute (RADIUS attribute 101) in the Disconnect-NAK message that it sends back to the RADIUS server. If the detected error does not map to one of the supported error-cause attributes, the router sends the Disconnect-NAK without an error-cause attribute. Table 42 lists the supported error-cause codes.

Table 42: Error-Cause Codes (RADIUS Attribute 101)

Code	Value	Description
401	Unsupported attribute	The request contains an attribute that is not supported (for example, a third-party attribute).
402	Missing attribute	A critical attribute (for example, the session identification attribute) is missing from a request.
404	Invalid request	Some other aspect of the request is invalid, such as if one or more attributes (for example, the packet mirroring Mirror Identifier value) are not formatted properly.
503	Session context not found	The session context identified in the request does not exist on the NAS.
504	Session context not removable	The subscriber identified by attributes in the disconnect request is owned by a component that does not support RADIUS-initiated disconnect (for example, IP LAC subscribers cannot be disconnected).
506	Resources unavailable	A request could not be honored due to lack of available NAS resources (such as memory).

Qualifications for Disconnect

For the server to disconnect a user, the Disconnect-Request message must contain an attribute with a session ID. The Disconnect-Request message can contain an Acct-Session-Id (44) attribute or a Acct-Multi-Session-Id (50) attribute for the session ID or both. If both the Acct-Session-Id and Acct-Multi-Session-Id attributes are present in the request, the router uses both attributes. If the User-Name (1) attribute is also present in the request, the username and session ID are used to perform the disconnection. Authentication, authorization, and accounting (AAA) services handle the actual request.

NOTE: To enable the disconnection of L2TP LAC user sessions, the RADIUS Disconnect-Request message must not include the Acct-Multi-Session-Id (50) attribute. The Acct-Multi-Session-Id attribute does not apply to LAC L2TP user sessions and including this attribute causes the disconnect operation to fail.

Security/Authentication

The RADIUS server (the disconnect client) must calculate the authenticator as specified for an Accounting-Request message in RFC 2866. The router's RADIUS dynamic-request server verifies the request using authenticator calculation as specified for an Accounting-Request message in RFC 2866. A key (secret), as specified in RFC 2865, must be configured and used in the calculation of the authenticator. The response authenticator is calculated as specified for an Accounting-Response message in RFC 2866.

Configuring RADIUS-Initiated Disconnect

To configure RADIUS-initiated disconnect feature, perform the following steps to set up the RADIUS dynamic-request server that will perform the disconnect operation:

1. Configure the RADIUS dynamic-request server, and enter RADIUS Configuration mode.

   ```
   host1(config)#radius dynamic-request server 10.10.5.10
   host1(config-radius)#
   ```

2. Enable the RADIUS-initiated disconnect capability on the RADIUS dynamic-request server.

   ```
   host1(config-radius)#subscriber disconnect
   ```

3. Define the secret used in the RADIUS Authenticator field during exchanges between the RADIUS dynamic-request server and the RADIUS server.

   ```
   host1(config-radius)#key Secret3Clientkey
   ```

4. (Optional) Specify the UDP port on which the RADIUS dynamic-request server listens for messages from the RADIUS server. The default is 1700.

   ```
   host1(config-radius)#udp-port 1770
   ```

RADIUS-Initiated Change of Authorization

This section describes the RADIUS dynamic-request server's support for CoA messages. CoA messages are used by the E-series router's RADIUS-initiated packet mirroring feature, which is described in *JUNOSe Policy Management Configuration Guide, Chapter 12, Configuring RADIUS-Based Mirroring*, and by Service Manager, which is described in *Chapter 27, Configuring Service Manager* of this guide.

Change-of-Authorization Messages

The RADIUS dynamic-request server receives and processes the unsolicited CoA messages from RADIUS servers. The RADIUS-initiated CoA feature uses the following codes in its RADIUS request and response messages:

- CoA-Request (43)
- CoA-ACK (44)
- CoA-NAK (45)

Message Exchange

The RADIUS server and the router's RADIUS dynamic-request server exchange messages using UDP. The CoA-Request message sent by the RADIUS server has the same format as the Disconnect-Request packet that is sent for a disconnect operation.

The response is either a CoA-ACK or a CoA-NAK message:

- If AAA successfully changes the authorization, the response is a RADIUS-formatted packet with a CoA-ACK message, and the data filter is applied to the session.
- If AAA is unsuccessful, the request is malformed, or attributes are missing, the response is a RADIUS-formatted packet with a CoA-NAK message.

Supported Error-Cause Codes (RADIUS Attribute 101)

When AAA is unsuccessful, the RADIUS dynamic-request server includes an error-cause attribute (RADIUS attribute 101) in the CoA-NAK message that it sends back to the RADIUS server. If the detected error does not map to one of the supported error-cause attributes, the router sends the CoA-NAK without an error-cause attribute. Table 43 lists the supported error-cause codes.

Table 43: Error-Cause Codes (RADIUS Attribute 101)

Code	Value	Description
401	Unsupported attribute	The request contains an attribute that is not supported (for example, a third-party attribute).
402	Missing attribute	A critical attribute (for example, the session identification attribute) is missing from a request.

Table 43: Error-Cause Codes (RADIUS Attribute 101) (continued)

Code	Value	Description
404	Invalid request	Some other aspect of the request is invalid, such as if one or more attributes (for example, the packet mirroring Mirror Identifier value) are not formatted properly.
503	Session context not found	The session context identified in the request does not exist on the NAS.
504	Session context not removable	The subscriber identified by attributes in the disconnect request is owned by a component that does not support RADIUS-initiated disconnect (for example, IP LAC subscribers cannot be disconnected).
506	Resources unavailable	A request could not be honored due to lack of available NAS resources (such as memory).

Qualifications for Change of Authorization

To complete the change of authorization for a user, the CoA-Request must contain one of the following RADIUS attributes. AAA services handle the actual request.

- User-Name [attribute 1] (per virtual router context)
- Framed-IP-Address [attribute 8] (per virtual router context)
- Calling-Station-ID [attribute 31]
- Acct-Session-ID [attribute 44]

Security/Authentication

For change-of-authorization operations, the RADIUS server calculates the authenticator as specified for an Accounting-Request message in RFC 2866. The RADIUS dynamic-request server verifies the request using authenticator calculation as specified for an Accounting-Request in RFC 2866. A key (secret), as specified in RFC 2865, must be configured and used in the calculation of the authenticator. The response authenticator is calculated as specified for an Accounting-Response message in RFC 2866.

Configuring RADIUS-Initiated Change of Authorization

To configure the RADIUS dynamic-request change of authorization feature, perform the following steps to set up the RADIUS dynamic-request server that will perform the CoA operation:

1. Configure the RADIUS dynamic-request server, and enter RADIUS Configuration mode.

   host1(config)#**radius dynamic-request server 10.10.5.10**

2. Enable the CoA capability on the RADIUS dynamic-request server.

   host1(config-radius)#**authorization change**

3. Define the key (secret) used in the RADIUS Authenticator field during exchanges between the RADIUS dynamic-request server and the RADIUS server.

   host1(config-radius)#**key Secret21Clientkey**

4. (Optional) Specify the UDP port on which the router listens for messages from the RADIUS server. The default is 1700.

   host1(config-radius)#**udp-port 1770**

RADIUS Dynamic-Request Server Commands

This section describes commands used to configure RADIUS dynamic-request servers.

authorization change

- Use to enable the RADIUS dynamic-request server to receive CoA messages, such as packet mirroring attributes and Service Manager attributes, from the RADIUS server.
- Example

  host1(config)#**radius dynamic-request server 192.168.5.3**
  host1(config-radius)#**authorization change**

- Use the **no** version to disable receipt of the messages; any currently configured operations will continue.

key

- Use to define the key (secret) that is used to calculate the RADIUS Authenticator field during exchanges between the RADIUS dynamic-request server and the RADIUS server.
- If no key is specified, the router drops all requests from the RADIUS server.
- Example

  host1(config-radius)#**key Secret3Clientkey**

- Use the **no** version to set the default, no Authenticator.

radius disconnect client

- Use to configure a RADIUS disconnect client and enter RADIUS Configuration mode. Include the IP address of the RADIUS server that is acting as the disconnect client.
- Example

  host1(config)#**radius disconnect client 10.10.5.10**
  host1(config-radius)#

- Use the **no** version to remove the RADIUS disconnect client.

NOTE: The function of this command has been replaced by a combination of the RADIUS dynamic-request server feature and the **subscriber disconnect** command. This command might be removed completely in a future release.

radius dynamic-request server

- Use to configure a RADIUS dynamic-request server and enter RADIUS Configuration mode. Specify the IP address of the RADIUS server that exchanges messages with the RADIUS dynamic-request server.
- Example

  host1(config)#**radius dynamic-request server 10.10.5.10**
  host1(config-radius)#

- Use the **no** version to unconfigure the RADIUS dynamic-request server.

subscriber disconnect

- Use to enable the RADIUS dynamic-request server to receive RADIUS disconnect messages from a RADIUS server.
- Example

  host1(config-radius)#**subscriber disconnect**

- Use the **no** version to disable processing of disconnect packets.

NOTE: This command and the RADIUS dynamic-request server feature replace the **radius disconnect client** command, which may be removed completely in a future release. The RADIUS Disconnect Configuration mode is also deprecated.

udp-port

- Use to specify the UDP port on which the RADIUS dynamic-request server listens to receive messages from the RADIUS server.
- Example

  host1(config-radius)#**udp-port 1770**

- Use the **no** version to return to the default, port 1700.

Monitoring RADIUS Dynamic-Request Servers

To monitor RADIUS dynamic-request servers, see:

- Setting the Baseline for RADIUS Dynamic-Request Server Statistics on page 252
- Monitoring RADIUS Dynamic-Request Server Statistics on page 253
- Monitoring the Configuration of the RADIUS Dynamic-Request Server on page 254

Chapter 5

Configuring RADIUS Relay Server

This chapter describes the E-series router's RADIUS relay server feature. The RADIUS relay server provides authentication, authorization, accounting, and addressing services to wireless subscribers in public areas, such as airports and coffee shops. This chapter has the following sections:

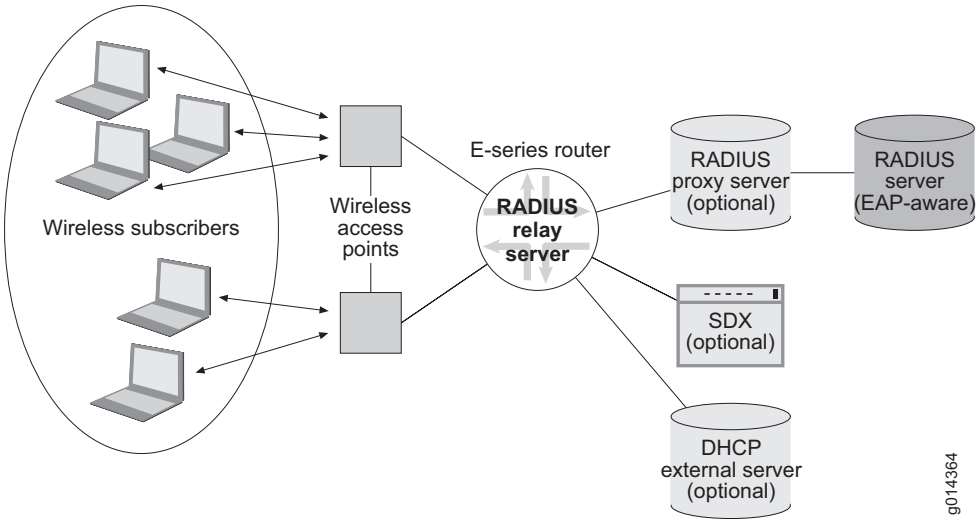
Overview

The JUNOSe RADIUS relay server provides authentication, authorization, accounting, and addressing services in an 802.1x-based wireless environment.

The IEEE 802.1x standard is an authentication standard for wireless LANs; it enables a wireless subscriber to be authenticated by a central authority. The standard uses the Extensible Authentication Protocol (EAP) for message exchange during the authentication process. The E-series router's RADIUS relay server enhances the 802.1x environment by including authorization, accounting, and addressing support for wireless subscribers.

Figure 6 illustrates a typical 802.1x-based wireless environment. In the figure, wireless subscribers connect to wireless access points (WAPs) for authentication. The WAPs in turn connect to the E-series router's RADIUS relay server. The RADIUS relay server passes the request on to the authentication server, which might be a RADIUS or TACACS+ server. The RADIUS server authenticates the subscriber, who is then granted access. After authentication, the RADIUS relay server obtains an IP address for the subscriber from the Dynamic Host Configuration Protocol (DHCP) local or external server. The RADIUS relay server can also use the RADIUS server or the optional Session and Resource Control (SRC) software (formerly the SDX software), to provide the accounting support.

Figure 6: RADIUS Relay Server



Platform Considerations

RADIUS relay is supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about RADIUS relay server, see the following resources:

- IEEE 802.1x-2001—Port-Based Network Access Control
- RFC 2869—RADIUS Extensions (June 2000)
- RFC 2284—PPP Extensible Authentication Protocol (EAP) (March 1998)
- RFC 3539—Authentication, Authorization and Accounting (AAA) Transport Profile (June 2003)

How RADIUS Relay Server Works

When a wireless subscriber starts a session, the WAP encapsulates EAP attributes into a RADIUS Access-Request message and sends the request to the E-series router, which the WAP views as the RADIUS server. The encapsulated message uses the RADIUS EAP-Message (79) attribute. The RADIUS relay server does not process any of the EAP attributes in the RADIUS Access-Request message; the encrypted message is simply passed through the router to the actual RADIUS server. The RADIUS server must be EAP aware.

You can also use an optional RADIUS proxy server to provide additional enhancements to the 802.1x-based environment. For example, the RADIUS proxy server enables subscribers to be multiplexed to multiple Internet service providers (ISPs) that are customers of the same carrier. The server performs one of the following actions:

- If the ISP's RADIUS server supports EAP, the RADIUS proxy server extends the EAP session to the RADIUS server.
- If the ISP's RADIUS server does not support EAP, the RADIUS proxy server translates the EAP session into a legacy RADIUS session for the RADIUS server.

Authentication and Addressing

The WAP initiates the authentication and authorization request by sending a standard RADIUS Access-Request to the RADIUS relay server. The Access-Request must include the attributes listed in Table 44. The attributes uniquely identify the wireless subscriber.

Table 44: Required RADIUS Access-Request Attributes

Attribute Name	Description
Called-Station-id [30]	Subscriber's WAP
Calling-Station-id [31]	Subscriber's media access control (MAC) address

When the RADIUS server authenticates the subscriber, the router's RADIUS relay server creates a RADIUS Access-Accept message and sends the message back to the subscriber. The router's DHCP server (either the router's DHCP local server or an external DHCP server) assigns an IP address to the subscriber and creates the subscriber interface.

For information about using the optional SRC software with the RADIUS relay server to assign IP addresses, see *RADIUS Relay Server and the SRC Software* on page 206.

The WAP might periodically reauthenticate a subscriber. For example, reauthentication is necessary to renegotiate a new Wired Equivalent Privacy (WEP) key. The RADIUS relay server ignores any new RADIUS attributes that are sent during a renegotiation operation.

Accounting

The RADIUS relay server's clients (the WAPs) send standard accounting request messages to the RADIUS relay server. The accounting server processes the request and sends the results back to the RADIUS relay server, which then creates a RADIUS accounting response message and forwards the information to the client WAP.

For tracking purposes, the forwarding RADIUS relay server adds the Radius-Client-Address vendor-specific attribute (VSA 26-52) to the forwarded accounting request messages. The VSA indicates the RADIUS relay server's IP address.

For information about using the SRC software with the RADIUS relay server to provide accounting, see *RADIUS Relay Server and the SRC Software* on page 206.

Table 45 shows the RADIUS attributes that must be included in accounting requests. The attributes uniquely identify subscribers.

Table 45: Required RADIUS Accounting Attributes

For RADIUS Acct-Start and Acct-Stop Messages	Description
Called-Station-id [30]	Subscriber's WAP
Calling-Station-id [31]	Subscriber's MAC address
For RADIUS Acct-On and Acct-Off Messages	
Called-Station-id [30]	Subscriber's WAP

Terminating the Wireless Subscriber's Connection

The RADIUS relay server terminates the wireless subscriber's session when one of the following events occurs. When a subscriber session is terminated, the subscriber's IP address is released back into the available address pool.

- The RADIUS relay server receives a RADIUS accounting stop request.
- No RADIUS accounting messages are received for this subscriber for more than 24 hours.

RADIUS Relay Server and the SRC Software

The SRC software is an advanced subscriber configuration and management service. The RADIUS relay server can optionally use the SRC software to perform addressing and accounting services for the subscriber and WAP.

The RADIUS relay server uses the E-series router's DHCP local server or DHCP external server and SRC client process to communicate with the SRC software.

Using the SRC Software for Addressing

If you integrate the SAE software into the RADIUS relay server configuration, the application can contribute to the address pool selection used to lease an address to the subscriber. The SRC software only contributes to address pool selection when the DHCP local server is used; it is not supported when a DHCP external server is used.

Using the SRC Application for Accounting

If you use the SRC software with the RADIUS relay server feature, two accounting domains might actually be created. The first domain is established by the WAP, when the subscriber is authenticated. The second domain is created for the connection between the E-series router and the SRC software.

If you want to continue to use the SRC software's user session and problem-tracking features, you should *not* configure the SRC software to generate RADIUS accounting records. Also, the following attributes must be configured on the RADIUS server used by the WAP:

- Service-Bundle [26-31]
- Class [25]
- User-Name [1]

Configuring RADIUS Relay Server Support

To configure the RADIUS relay server feature, you enable support for the feature on the E-series router and identify the key (secret) used for the connection between the WAP and the RADIUS relay server. The following example configures a RADIUS relay authentication server. Use similar steps to configure a RADIUS relay accounting server.

NOTE: The E-series router supports one instance of the RADIUS relay server per virtual router. The instance can provide authentication, authorization, and accounting support.

1. Enable RADIUS relay server support on the E-series router, and enter RADIUS Relay Configuration mode.

   host1(config)#**radius relay authentication server**
   host1(config-radius-relay)#

2. Specify the IP address and mask of the network that will use the relay authentication server, and the secret used during exchanges between the relay authentication server and clients (the WAPs).

   host1(config-radius-relay)#**key 192.168.25.9 255.255.255.255 mysecret**

3. Specify the router's User Datagram Protocol (UDP) port on which the RADIUS relay server listens.

   host1(config-radius-relay)#**udp-port 1812**

4. (Optional) Verify the configuration.

```
host1(config-radius-relay)#exit
host1(config)#exit
host1#show radius relay servers

RADIUS Relay Authentication Server Configuration
------------------------------------------------
 IP Address         IP Mask        Secret
-------------   ---------------   ---------
10.10.15.0      255.255.255.0     secret
10.10.8.15      255.255.255.255   newsecret
192.168.25.9    255.255.255.255   mysecret
192.168.102.5   255.255.255.255   999Y2K
Udp Port: 1812

RADIUS Relay Accounting Server Configuration
--------------------------------------------
 IP Address         IP Mask       Secret
-------------   ---------------   -------
10.10.1.0       255.255.255.0     NO8pxq
192.168.102.5   255.255.255.255   12BE$56
Udp Port: 1813
```

key

- Use to enter the IP address and mask of the network that will use the RADIUS relay server, and to specify the key (secret) used during exchanges between the RADIUS relay server and client.
- Example

  host1(config-radius-relay)#**key 10.10.15.25 255.255.255.0 Secret3Clientkey**

- Use the **no** version to delete the secret.

radius relay server

- Use to configure a RADIUS relay authentication or accounting server and enter RADIUS Relay Configuration mode.
- Example

  host1(config)#**radius relay authentication server**
  host1(config-radius-relay)#

- Use the **no** version to unconfigure the RADIUS relay server.

radius relay udp-checksum

- Use to enable or disable UDP checksum for RADIUS relay packets.
- Example

  host1(config)#**radius relay udp-checksum enable**

- Use the **no** version to restore the default, enable.

udp-port

- Use to specify the router's UDP port on which the RADIUS relay server resides.
- Example

  host1(config-radius-relay)#**udp-port 1850**

- Use the **no** version to return to the default, port 1812 for authentication servers or port 1813 for accounting servers.

Monitoring RADIUS Relay Server

To monitor RADIUS relay server, see:

- Setting the Baseline for RADIUS Dynamic-Request Server Statistics on page 252
- Monitoring RADIUS Dynamic-Request Server Statistics on page 253
- Monitoring the Configuration of the RADIUS Dynamic-Request Server on page 254

Chapter 6

RADIUS Attribute Descriptions

This chapter lists the RADIUS attributes that are supported by JUNOSe software. Table 46 describes the supported RADIUS IETF attributes. Table 47 describes the supported Juniper Networks vendor-specific attributes (VSAs). Table 48 describes the DSL Forum VSA formats supported by JUNOSe software. Table 49 describes RADIUS attributes that are simply passed to their destination by the router.

RADIUS attributes are discussed in the following sections:

RADIUS IETF Attributes

Table 46 describes the RADIUS IETF attributes supported by JUNOSe software. The attributes are sorted by standard number.

Table 46: RADIUS IETF Attributes Supported by JUNOSe Software

Attribute Number	Attribute Name	Description
[1]	User-Name	■ Name of user to be authenticated ■ Configurable username override
[2]	User-Password	■ Password of user to be authenticated ■ Configurable password override ■ Password Authentication Protocol (PAP)
[3]	CHAP-Password	Response value provided by a Point-to-Point Protocol (PPP) Challenge Handshake Authorization Protocol (CHAP) user in the response to an access challenge
[4]	NAS-IP-Address	■ IP address of the network access server (NAS) that is requesting authentication of the user ■ You can use the **radius update-source-addr** command to override this behavior; see *Chapter 1, Configuring Remote Access*.
[5]	NAS-Port	■ Physical port number of the NAS that is authenticating the user ■ See the **radius nas-port-format**, **radius pppoe nas-port-format unique**, and **radius vlan nas-port-format stacked** commands in *Chapter 3, Configuring RADIUS Attributes*.
[6]	Service-Type	■ Type of service the user has requested or the type of service to be provided ■ Admin, Login, NAS Prompt, or Framed only
[7]	Framed-Protocol	■ Framing protocol used for framed access ■ Standard value of 1 set for PPP ■ Nonstandard value of 1008 set for dynamic ATM
[8]	Framed-IP-Address	■ IP address to be configured for the user ■ 0.0.0.0 or absence is interpreted as 255.255.255.254 ■ See the **radius include framed-ip-add acct-start** command in *Chapter 3, Configuring RADIUS Attributes*.
[9]	Framed-IP-Netmask	■ IP network to be configured for the user when the user is a router to a network ■ Absence implies 255.255.255.255
[11]	Filter-Id	■ Name of the filter list for the user ■ Interpreted as input policy name
[12]	Framed-MTU	■ The maximum transmission unit to be configured for the user, when it is not negotiated by some other means (such as PPP). ■ When sent in an Access-Request with an EAP-Message, indicates the maximum size of the EAP-Message string that the external server supports.
[13]	Framed-Compression	Always set to none.
[18]	Reply-Message	■ Text that may be displayed to the user ■ Only the first instance of this attribute is used

Table 46: RADIUS IETF Attributes Supported by JUNOSe Software (continued)

Attribute Number	Attribute Name	Description
[22]	Framed-Route	String that provides routing information to be configured for the user on the NAS; in the format: < addr > [/ < maskLen >] [< nexthop > [< cost >]] [tag < tagValue >] [distance < distValue >]
[24]	State	■ An arbitrary value that the router includes in new Access-Request packets from the previous Accept-Challenge ■ Applicable for CLI, telnet, or EAP message exchange
[25]	Class	An arbitrary value that the NAS includes in all accounting packets for the user if supplied by the RADIUS server
[26]	Vendor-Specific	Juniper Networks Enterprise number 0x0000130A
[27]	Session-Timeout	Maximum number of consecutive seconds of service to be provided to the user before termination of the session
[28]	Idle-Timeout	Maximum number of consecutive seconds of idle connection provided to the user before termination of the session
[30]	Called-Station-Id	■ Allows the NAS to send the phone number that the user called ■ Not supported for nontunneled or LAC session side ■ For the LNS, the format is the string passed in the Called Number AVP ■ For RADIUS relay server, indicates the subscriber's wireless access point
[31]	Calling-Station-Id	■ Allows the NAS to send the phone number from which the call originated ■ See the **radius calling-station-format** and the **radius calling-station-delimiter** commands in *Chapter 3, Configuring RADIUS Attributes*. ■ For RADIUS relay server, indicates the subscriber's MAC address
[32]	NAS-Identifier	■ Identifies the NAS originating the request ■ System-wide configurable hostname or VR-sensitive configurable NAS-identifier name
[33]	Proxy-State	E-series router's port ID and IP address
[40]	Acct-Status-Type	Indicates whether this Accounting-Request marks the beginning of the user service (Start), the end (Stop), or the interim (Interim-Update)
[41]	Acct-Delay-Time	Indicates how many seconds the client has been trying to send a particular record
[42]	Acct-Input-Octets	■ Indicates how many octets have been received from the port during the time this service has been provided ■ IP subscriber manager—Statistics are reported ■ PPP—Statistics are counted according to the rules of the generic interface MIB
[43]	Acct-Output-Octets	■ Indicates how many octets have been sent to the port during the time this service has been provided ■ IP subscriber manager—Statistics are reported ■ PPP—Statistics are counted according to the rules of the generic interface MIB

Table 46: RADIUS IETF Attributes Supported by JUNOSe Software (continued)

Attribute Number	Attribute Name	Description
[44]	Acct-Session-Id	■ Unique accounting identifier that makes it easy to match start and stop records in a log file ■ See the **radius acct-session-id-format** and the **radius include acct-session-id access-request** commands in *Chapter 3, Configuring RADIUS Attributes*.
[45]	Acct-Authentic	■ Indicates how the user was authenticated: whether by RADIUS, the NAS itself, or another remote authentication protocol ■ Always 1
[46]	Acct-Session-Time	Indicates how long in seconds that the user has received service
[47]	Acct-Input-Packets	■ Indicates how many packets have been received from the port during the time this service has been provided to a framed user ■ IP subscriber manager—Statistics are reported ■ PPP—Statistics are counted according to the rules of the generic interface MIB
[48]	Acct-Output-Packets	■ Indicates how many packets have been sent to the port in the course of delivering this service to a framed user ■ IP subscriber manager—Statistics are reported ■ PPP—Statistics are counted according to the rules of the generic interface MIB
[49]	Acct-Terminate-Cause	Contains the reason the service (a PPP session) was terminated. The service can be terminated for the following reasons: ■ User Request (1)—User initiated the disconnect (log out) ■ Idle Timeout (4)—Idle timer has expired ■ Session Timeout (5)—Client reached the maximum continuous time allowed on the service or session ■ Admin Reset (6)—System administrator terminated the session ■ Port Error (8)—PVC failed; no hardware or no interface ■ NAS Error (9)—Negotiation failures, connection failures, or address lease expiration ■ NAS Request (10)—PPP challenge timeout, PPP request timeout, tunnel establishment failure, PPP bundle failure, IP address lease expiration, PPP keep-alive failure, Tunnel disconnect, or an unaccounted-for error
[50]	Acct-Multi-Session-Id	■ String constructed from the Acct-Session-ID of the first PPP link established for the Multilink PPP bundle and the internal Multilink PPP bundle ID. ■ This string is the hexidecimal ASCII characters for two 4-octet unsigned integers. Example: 0a34331200001249.
[51]	Acct-Link-Count	A value that increments with each link that joins the MLPPP bundle. This attribute does not indicate the number of active links. For more details, see *RFC 2866—RADIUS Accounting (June 2000)*.
[52]	Acct-Input-Gigawords	■ Indicates how many times the Acct-Input-Octets counter has wrapped around 2^32 during the time this service has been provided, and can be present in Accounting-Request records only where the Acct-Status-Type is set to Stop or Interim-Update ■ IP subscriber manager—Statistics are reported ■ PPP—Statistics are counted according to the rules of the generic interface MIB

Table 46: RADIUS IETF Attributes Supported by JUNOSe Software (continued)

Attribute Number	Attribute Name	Description
[53]	Acct-Output-Gigawords	■ Indicates how many times the Acct-Output-Octets counter has wrapped around 2^32 in the course of delivering this service, and can be present in Accounting-Request records only where the Acct-Status-Type is set to Stop or Interim-Update ■ IP subscriber manager—Statistics are reported ■ PPP—Statistics are counted according to the rules of the generic interface MIB
[55]	Event-Timestamp	Records the time that this event occurred on the NAS, in seconds, since January 1, 1970 00:00 UTC
[60]	CHAP-Challenge	Contains the CHAP challenge sent by the NAS to a PPP CHAP user
[61]	NAS-Port-Type	■ Indicates the type of physical port the NAS is using to authenticate the user ■ See the **radius dsl-port-type** and the **radius ethernet-port-type** commands in *Chapter 3, Configuring RADIUS Attributes*.
[62]	Port-Limit	Specifies the maximum number of MLPPP member links allowed for the subscriber
[64]	Tunnel-Type	■ Which tunneling protocol to use (in the case of a tunnel initiator) or the tunneling protocol in use (in the case of a tunnel terminator) ■ Only L2TP tunnels supported at this time
[65]	Tunnel-Medium-Type	■ Transport medium to use when creating a tunnel for those protocols (such as L2TP) that can operate over multiple transports ■ Only IPv4 supported at this time
[66]	Tunnel-Client-Endpoint	Address of the initiator end of the tunnel
[67]	Tunnel-Server-Endpoint	Address of the server end of the tunnel
[68]	Acct-Tunnel-Connection	■ Indicates the identifier assigned to the tunnel session ■ Value is L2TP call-serial number
[69]	Tunnel-Password	Password to be used to authenticate to a remote server
[77]	Connect-Info	Sent from the NAS to indicate the nature of the user's connection
[79]	EAP-Message	Encapsulates EAP packets, which allows the NAS to authenticate users through EAP without having to understand the EAP protocol
[80]	Message-Authenticator	Must be used in any Access-Request, Access-Accept, Access-Reject or Access-Challenge messages that include EAP-Message attributes
[82]	Tunnel-Assignment-Id	Indicates to the tunnel initiator the particular tunnel to which a session is to be assigned
[83]	Tunnel-Preference	■ If more than one set of tunneling attributes is returned by the RADIUS server to the tunnel initiator, this attribute is included in each set to indicate the relative preference assigned to each tunnel. ■ Included in the Tunnel-Link-Start, the Tunnel-Link-Reject, and the Tunnel-Link-Stop packets (LAC only)
[85]	Acct-Interim-Interval	Number of seconds between each interim accounting update for this session
[86]	Acct-Tunnel-Packets-Lost	Number of packets lost on a given link

Table 46: RADIUS IETF Attributes Supported by JUNOSe Software (continued)

Attribute Number	Attribute Name	Description
[87]	NAS-Port-Id	■ Text string that identifies the physical interface of the NAS that is authenticating the user ■ If the PPP user connects via ATM slot 12, port 2, subinterface 3, vpi 100, vci 101, then the NAS-Port-Id value in the RADIUS packets will be **atm 12/2.3:100.101** ■ If the user is a PPP user that started as a result of the E-series LNS feature (that is, no physical port), then the NAS-Port-Id value is as follows: *media:local address:peer address:local tunnel id:peer tunnel id:local session id:peer session id:call serial number* ■ For example: **ip:172.81.1.98:172.81.1.99:18d:cb8:ce6:9f4:6** ■ In this case, the local information refers to the LNS, and the peer information refers to the LAC ■ NAS-Port-Id usually contains one of the following: ■ atm < slot > / < port > < .subinterface > : < vpi > . < vci > ■ FastEthernet < slot > / < port > < .subinterface > [: < vlan >] ■ GigabitEthernet < slot > / < port > < .subinterface > [< vlan > ■ serial < slot > / < port > [: < sonetPath > [/ < sonetTributary (x/x/x) > [/ < fractionalInterface >]]] ■ from LNS—ip:local ip:peer ip:local tid:peer tid:local sid:peer sid:call serial number tid—tunnel id sid—session id **NOTE:** Releases before 4.0.0 did not pass the subinterface number to RADIUS for inclusion in the NAS-Port-Id. If you do not want the subinterface number to be included, you must enter the **aaa intf-desc-format include sub-intf disable** command to omit the subinterface.
[88]	Framed-Pool	Name of an assigned address pool that should be used to assign an address for the user
[90]	Tunnel-Client-Auth-Id	Name used by the tunnel initiator during the authentication phase of tunnel establishment
[91]	Tunnel-Server-Auth-Id	Name used by the tunnel terminator during the authentication phase of tunnel establishment
[96]	Framed-Interface-Id	IPv6 interface identifier configured by the user
[97]	Framed-Ipv6-Prefix	Provides the IPv6 prefix that is delegated to a downstream CPE
[99]	Framed-Ipv6-Route	Provides routing information to be configured for the user on the NAS
[101]	Error-Cause	4-octet field that contains an integer that specifies the cause of the error
[135]	Ascend-Primary-DNS	■ Indicates the IP address of the primary DNS ■ The format is 1 byte of type (135), 1 byte of length (length = 6), 4 bytes of value (IPv4 address)
[136]	Ascend-Secondary-DNS	■ Indicates the IP address of the secondary DNS ■ The format is 1 byte of type (136), 1 byte of length (length = 6), 4 bytes of value (IPv4 address)
[188]	Ascend-Num-In-Multilink	Current number of links in a multilink bundle
[242]	Ascend-Data-Filter	RADIUS policy definitions used to configure a policy to classify packet flows and perform filter, forward, packet marking, rate-limit profile, and traffic class actions

Juniper Networks VSAs

Table 47 lists Juniper Networks VSA formats for RADIUS. JUNOSe software uses the vendor ID assigned to Juniper Networks (vendor ID 4874) by the Internet Assigned Numbers Authority (IANA).

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-1]	Virtual-Router	■ Virtual router name for the Broadband Remote Access Server (B-RAS) user's IP interface. ■ Allowed only from RADIUS server in default virtual router context. ■ For restricted users, specifies the only virtual router that the user can access. ■ For nonrestricted users, specifies the initial virtual router that the user accesses. ■ See the **enable** command in *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.	len	sublen	string: virtual-router-name
[26-2]	Local-Address-Pool	■ Name of an assigned address pool that should be used to assign an address for the user ■ Same as RADIUS attribute 88, Framed-Pool	len	sublen	string: address-pool-name
[26-3]	Local-Interface	Interface to apply to the E-series side of the connection	len	sublen	string: local-interface
[26-4]	Primary-DNS	■ B-RAS user's DNS address negotiated during IPCP ■ 4-octet IP address	12	6	integer: 4-byte primary-dns-address
[26-5]	Secondary-DNS	■ B-RAS user's DNS address negotiated during IPCP ■ 4-octet IP address	12	6	integer: 4-byte secondary-dns-address
[26-6]	Primary-WINS (NBNS)	■ B-RAS user's WINS (NBNS) address negotiated during IPCP ■ 4-octet IP address	12	6	integer: 4-byte primary-wins-address
[26-7]	Secondary-WINS (NBNS)	■ B-RAS user's WINS (NBNS) address negotiated during IPCP ■ 4-octet IP address	12	6	integer: 4-byte secondary-wins-address
[26-8]	Tunnel-Virtual-Router	Virtual router name for tunnel connection	len	sublen	string: tunnel-virtual-router
[26-9]	Tunnel-Password	Tunnel password in cleartext	len	sublen	string: tunnel-password
[26-10]	Ingress-Policy-Name	Input policy name to apply to B-RAS user's interface	len	sublen	string: input-policy-name
[26-11]	Egress-Policy-Name	Output policy name to apply to B-RAS user's interface	len	sublen	string: output-policy-name

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-12]	Ingress-Statistics	Enable or disable input statistics on B-RAS user's interface	12	6	integer: 0 = disable, 1 = enable
[26-13]	Egress-Statistics	Enable or disable output statistics on B-RAS user's interface	12	6	integer: 0 = disable, 1 = enable
[26-14]	Service-Category	ATM service category to apply to B-RAS user's interface	12	6	integer: 1 = UBR, 2 = UBR PCR, 3 = NRT VBR, 4 = CBR 5 = RT VBR,
[26-15]	PCR	■ Peak cell rate ■ 4-octet integer	12	6	integer: 4-octet
[26-16]	SCR	■ Sustained cell rate ■ 4-octet integer	12	6	integer: 4-octet
[26-17]	Mbs	■ Maximum burst rate ■ 4-octet integer	12	6	integer: 4-octet
[26-18]	Init-CLI-Access-Level	■ Specifies the initial level of access to CLI commands ■ See the **enable** command in *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.	len	sublen	single attribute: enter 0, 1, 5, 10, or 15
[26-19]	Allow-All-VR-Access	■ Specifies user access to all virtual routers ■ See the **enable** command in *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.	len	sublen	integer: 0 = disable, 1 = enable
[26-20]	Alt-CLI-Access-Level	■ Specifies other levels of access to CLI commands ■ See the **enable** command in *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.	len	sublen	single attribute; enter 0, 1, 5, 10, or 15
[26-21]	Alt-CLI-Vrouter-Name	■ For restricted users, specifies other VRs that the user may access. ■ See the **enable** command in *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.	len	sublen	string: virtual-router-name
[26-22]	Sa-Validate	■ Enable or disable source address validation on a user's interface ■ 4-octet integer	len	sublen	integer: 0 = disable, 1 = enable
[26-23]	Igmp-Enable	■ Enable or disable IGMP on a user's interface ■ Allows the end user to register for the reception of multicast services ■ 4-octet integer	len	sublen	integer: 0 = disable, 1 = enable
[26-24]	Pppoe-Description	The string *pppoe < mac addr >* sent to the RADIUS server supplied by PPPoE	len	sublen	string: pppoe < mac addr >

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-25]	Redirect-Vrouter-Name	■ Virtual router name indicating the VR context in which to authenticate the user ■ Behavior is similar to that of a remote domain-map lookup.	len	sublen	authentication-redirection
[26-26]	QoS-Profile-Name	Name of the QoS profile to attach to the user's interface	len	sublen	string: qos-profile-name
[26-28]	PppoE-Url	PPPoE URL that is passed to PPPoE subscribers	len	sublen	string:URL
[26-30]	Tunnel-Nas-Port-Method	Conveys nasPort and nasPort type in tunnel	12	6	4-octet integer: 0 = none, 1 = Cisco CLID
[26-31]	Service-Bundle	Specifies the SRC service bundle	len	sublen	string
[26-33]	Tunnel-Max-Sessions	Maximum number of sessions allowed in a tunnel	12	6	integer: 4-octet
[26-34]	Framed-Ip-Route-Tag	Route tag to apply to returned framed-ip-address	12	6	integer: 4-octet
[26-35]	Tunnel-Dialout-Number	Dial number in L2TP dial-out	len	sublen	string:dial-out-number
[26-36]	PPP-Username	Username used in PPP L2TP dial-out sessions at the LNS for L2TP dial-out	len	sublen	string: ppp-username
[26-37]	PPP-Password	Password used in PPP L2TP dial-out sessions at the LNS for L2TP dial-out	len	sublen	string: ppp-password
[26-38]	PPP-Protocol	PPP authentication protocol used for L2TP dial-out sessions at the LNS	12	6	integer: 0 = none; 1 = PAP; 2 = CHAP; 3 = PAP-CHAP; 4 = CHAP-PAP
[26-39]	Tunnel-Min-Bps	Minimum line speed for L2TP dial-out	12	6	integer
[26-40]	Tunnel-Max-Bps	Maximum line speed for L2TP dial-out	12	6	integer
[26-41]	Tunnel-Bearer-Type	Bearer capability required for L2TP dial-out	12	6	integer: 0 = none; 1 = analog; 2 = digital
[26-42]	Input-GigaPkts	Number of times input-packets attribute rolls over its 4-octet field	12	6	integer
[26-43]	Output-GigaPkts	Number of times output-packets attribute rolls over its 4-octet field	12	6	integer
[26-44]	Tunnel-Interface-Id	Tunnel interface selector that AAA caches as part of the tunnel-session profile and the user's profile. This attribute is available to the RADIUS authentication and accounting servers.	len	sublen	string: tunnel selector
[26-45]	Ipv6-Virtual-Router	Virtual router name for B-RAS user's IPv6 interface	len	sublen	string: virtual-router-name
[26-46]	Ipv6-Local-Interface	Local IPv6 interface to apply to the E-series side of the connection	len	sublen	string: ipv6-local-interface
[26-47]	Ipv6-Primary-DNS	B-RAS user's primary IPv6 DNS address negotiated by DHCP	len	sublen	hexadecimal string: ipv6-primary-dns-address

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-48]	Ipv6-Secondary-DNS	B-RAS user's secondary IPv6 DNS address negotiated by DHCP	len	sublen	hexadecimal string: ipv6-primary-dns-address
[26-51]	Disconnect-Cause	L2TP PPP disconnect cause information received by the LAC	len	sublen	string:l2tp-ppp-disconnect-cause
[26-52]	Radius-Client-Address	RADIUS relay server's IP address	12	6	integer:4-octet
[26-53]	Service-Description	AAA profile service description string	len	sublen	string:profile-service-description
[26-54]	L2tp-Recv-Window-Size	■ L2TP receive window size (RWS) for a tunnel on the LAC ■ Number of packets that the peer can transmit without receiving an acknowledgment from the router ■ 4-octet integer	12	6	integer:4-octet
[26-55]	DHCP-Options	Client's DHCP options	len	sublen	string:dhcp-options
[26-56]	DHCP-MAC-Address	Client's MAC address	len	sublen	string:mac-address
[26-57]	DHCP-GI-Address	DHCP relay agent's IP address	12	6	integer:4-octet
[26-58]	LI-Action	Packet mirroring action	len	sublen	Salt encrypted integer: 0 = stop monitoring; 1 = start monitoring; 2 = no action
[26-59]	Med-Dev-Handle	Link to which packet mirroring is applied	len	sublen	Salt encrypted string; contains an ASCII-encoded unsigned integer
[26-60]	Med-Ip-Address	IP address of analyzer device to which mirrored packets are forwarded	len	sublen	Salt encrypted IP address
[26-61]	Med-Port-Number	UDP port in the analyzer device to which mirrored packets are forwarded	len	sublen	Salt encrypted integer
[26-62]	MLPPP-Bundle-Name	Text string that identifies the Multilink PPP bundle name	len	sublen	string:mlppp-bundle-name
[26-63]	Interface-Desc	Text string that identifies the subscriber's access interface	len	sublen	string:interface-description
[26-64]	Tunnel-Group	Name of the tunnel group assigned to a domain map	len	sublen	string:tunnel-group-name
[26-65]	Activate-Service	Service to activate for the subscriber	len	sublen	string:service-name
[26-66]	Deactivate-Service	Service to deactivate for the subscriber	len	sublen	string:service-name
[26-67]	Service-Volume-tagX	Amount of traffic, in MB, that can use the service; service is deactivated when the volume is exceeded	12	6	integer: volume in MB; 0 = infinite volume
[26-68]	Service-Timeout-tagX	Number of seconds that the service can be active; service is deactivated when the timeout expires	12	6	integer: time in seconds; 0 = no timeout

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-69]	Service-Statistics-tagX	Enable or disable statistics for the service	12	6	integer: 0 = disable; 1 = enable time statistics; 2 = enable time and volume statistics
[26-70]	Ignore-DF-Bit	Enable or disable the ignore don't fragment (DF) bit feature on a B-RAS user's interface	12	6	integer: 0 = disable; 1 = enable
[26-71]	IGMP-Access-Name	Access List to use for the group (G) filter	len	sublen	string:32-octet
[26-72]	IGMP-Access-Src-Name	Access List to use for the source-group (S,G) filter	len	sublen	string:32-octet
[26-73]	IGMP-OIF-Map-Name	Multicast OIF (outgoing interface) mapping	len	sublen	string:32-octet
[26-74]	MLD-Access-Name	Access List to use for the group (G) filter	len	sublen	string:32-octet
[26-75]	MLD-Access-Src-Name	Access List to use for the source-group (S,G) filter	len	sublen	string:32-octet
[26-76]	MLD-OIF-Map-Name	Multicast OIF (outgoing interface) mapping	len	sublen	string:32-octet
[26-77]	MLD-Version	MLD Protocol Version (MLD Version 1 = 1; MLD Version 2 = 2)	12	6	integer:1-octet
[26-78]	IGMP-Version	IGMP Protocol Version (IGMP Version 1 = 1; IGMP Version 2 = 2; IGMP Version 3 = 3)	12	6	integer:1-octet
[26-79]	IP-Mcast-Adm-Bw-Limit	The maximum multicast bandwidth that will be admitted on an IP interface, in Kbps	12	6	integer:4-octet
[26-80]	IPv6-Mcast-Adm-Bw-Limit	The maximum multicast bandwidth that will be admitted on an IPv6 interface, in Kbps	12	6	integer:4-octet
[26-81]	L2c-Information	Series of type length value (tlv) fields (binary) representing the access loop parameters as defined in GSMP extensions for layer2 control (L2C) Topology Discovery and Line Configuration—draft-wadhwa-gsmp-l2control-configuration-00.txt (July 2006 expiration)	len	sublen	string: format is a series of type length value (tlv) fields (binary) representing the access loop parameters
[26-82]	Qos-Parameters	Name of the QoS parameter instance to create on the user's interface, followed by the value of the parameter. For example, the max-bandwidth 4000000 parameter instance represents the parameter name that was defined using the qos-parameter-define command (max-bandwidth) and the value to assign to the parameter (4000000). Multiple instances of this VSA can be returned from RADIUS using this format.	len	sublen	string: format is *parameter name parameter value*, where *parameter name* is ASCII name of a parameter name found in the QoS parameter definition and *parameter value* is the ASCII representation of 0–21474836470; multiple instances of this VSA can be returned from RADIUS using this format

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-83]	Service-Session	Name of the service (including parameter values) that is associated with service manager statistics	len	sublen	string:service-name
[26-84]	Mobile-IP-Algorithm	Authentication algorithm used for Mobile IP registration	12	6	integer: 4-octet
[26-85]	Mobile-IP-SPI	Security parameter index for Mobile IP registration	12	6	integer: 4-octet
[26-86]	Mobile-IP-Key	Security association MD-5 key for Mobile IP registration	len	sublen	string: 32-octet
[26-87]	Mobile-IP-Replay	Replay time stamp for Mobile IP registration	12	6	integer: 4-octet
[26-88]	Mobile-IP-Access-Control-List	Access control list to filter on basis of care-of address	len	sublen	string: 32-octet
[26-89]	Mobile-IP-Lifetime	Registration lifetime for Mobile IP registration	12	6	integer: 4-octet
[26-90]	L2TP-Resynch-Method	L2TP peer resynchronization method	12	6	integer: 0 = disabled; 1 = failover protocol; 2 = silent failover; 3 = failover protocol with silent failover as backup
[26-91]	Tunnel-Switch-Profile	■ Name of the L2TP tunnel switch profile ■ The L2TP tunnel switch profile defines the L2TP tunnel switching behavior for the interfaces to which this profile is assigned	len	sublen	string: tunnel-switch-profile
[26-92]	L2C-Up-Stream-Data	Actual upstream rate access loop parameter (ASCII encoded) as defined in GSMP extensions for layer2 control (L2C) Topology Discovery and Line Configuration—draft-wadhwa-gsmp-l2control-configuration-00.txt (July 2006 expiration).	len	sublen	string: actual upstream rate access loop parameter (ASCII encoded)
[26-93]	L2C-Down-Stream-Data	Actual downstream rate access loop parameter (ASCII encoded) as defined in GSMP extensions for layer2 control (L2C) Topology Discovery and Line Configuration—draft-wadhwa-gsmp-l2control-configuration-00.txt (July 2006 expiration).	len	sublen	string: actual downstream rate access loop parameter (ASCII encoded)

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-94]	Tunnel-Tx-Speed-Method	The method that the router uses to calculate the transmit connect speed of the subscriber's access interface. This speed is reported in L2TP Transmit (TX) Speed AVP 24. During the establishment of an L2TP tunnel session, the LAC sends AVP 24 to the LNS to convey the transmit speed of the subscriber's access interface.	12	6	integer: 1 = static-layer2, TX speed based on static layer 2 settings; 2 = dynamic-layer2, TX speed based on dynamic layer 2 settings; 3 = qos, TX speed based on QoS settings; 4 = actual, TX speed that is the lesser of the dynamic-layer2 value or the qos value
[26-95]	IGMP-Query-Interval	IGMP Query Interval	12	6	integer: 4-octet
[26-96]	IGMP-Max-Resp-Time	IGMP Maximum Response Time	12	6	integer: 4-octet
[26-97]	IGMP-Immediate-Leave	IGMP Immediate Leave	12	6	4-octet integer: 0 = disabled 1 = enabled
[26-98]	MLD-Query-Interval	MLD Query Interval	12	6	integer: 4-octet
[26-99]	MLD-Max-Resp-Time	MLD Maximum Response Time	12	6	integer: 4-octet
[26-100]	MLD-Immediate-Leave	MLD Immediate Leave	12	6	4-octet integer: 0 = disabled 1 = enabled
[26-110]	Acc-Loop-Cir-Id	Identification of the subscriber node connection to the access node	len	sublen	string: up to 63 ASCII characters
[26-111]	Acc-Aggr-Cir-Id-Bin	Unique identification of the DSL line	len	sublen	integer: 8-octet
[26-112]	Acc-Aggr-Cir-Id-Asc	Identification of the uplink on the access node. For example: ■ For Ethernet access aggregation: *ethernet slot/port* [:*inner-vlan-id*] [:*outer-vlan-id*] ■ For ATM aggregation: *atm slot/port:vpi.vci*	len	sublen	string: up to 63 ASCII characters
[26-113]	Act-Data-Rate-Up	Actual upstream data rate of the subscriber's synchronized DSL link	12	6	integer: 4-octet
[26-114]	Act-Data-Rate-Dn	Actual downstream data rate of the subscriber's synchronized DSL link	12	6	integer: 4-octet
[26-115]	Min-Data-Rate-Up	Minimum upstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-116]	Min-Data-Rate-Dn	Minimum downstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-117]	Att-Data-Rate-Up	Upstream data rate that the subscriber can attain	12	6	integer: 4-octet
[26-118]	Att-Data-Rate-Dn	Downstream data rate that the subscriber can attain	12	6	integer: 4-octet
[26-119]	Max-Data-Rate-Up	Maximum upstream data rate configured for the subscriber	12	6	integer: 4-octet

Table 47: Juniper Networks (Vendor ID 4874) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-120]	Max-Data-Rate-Dn	Maximum downstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-121]	Min-LP-Data-Rate-Up	Minimum upstream data rate in low power state configured for the subscriber	12	6	integer: 4-octet
[26-122]	Min-LP-Data-Rate-Dn	Minimum downstream data rate in low power state configured for the subscriber	12	6	integer: 4-octet
[26-123]	Max-Interlv-Delay-Up	Maximum one-way upstream interleaving delay configured for the subscriber	12	6	integer: 4-octet
[26-124]	Act-Interlv-Delay-Up	Subscriber's actual one-way upstream interleaving delay	12	6	integer: 4-octet
[26-125]	Max-Interlv-Delay-Dn	Maximum one-way downstream interleaving delay configured for the subscriber	12	6	integer: 4-octet
[26-126]	Act-Interlv-Delay-Dn	Subscriber's actual one-way downstream interleaving delay	12	6	integer: 4-octet
[26-127]	DSL-Line-State	State of the DSL line	12	6	4-octet integer 1 = Show uptime 2 = Idle 3 = Silent
[26-128]	DSL-Type	Encapsulation used by the subscriber associated with the DSLAM interface from which requests are initiated	11	5	string: 3-byte
[26-129]	Ipv6-NdRa-Prefix	Prefix value in IPv6 Neighbor Discovery route advertisements	len	sublen	hexadecimal string
[26-140]	Service-Interim-Acct-Interval	Amount of time between interim accounting updates for this service.	12	6	integer: time in the range 600–86400 seconds; 0 = disabled
[26-141]	Downstream-Calculated-Qos-Rate	Calculated downstream QoS rate in Kbps as set by the ANCP configuration	12	6	integer: 4-octet
[26-142]	Upstream-Calculated-Qos-Rate	Calculated downstream QoS rate in Kbps as set by the ANCP configuration	12	6	integer: 4-octet

DSL Forum VSAs

Table 48 describes the DSL Forum VSAs supported by JUNOSe software for RADIUS. JUNOSe software uses the vendor ID assigned to the DSL Forum (3561, or DE9 in hexadecimal format) by the Internet Assigned Numbers Authority (IANA).

Table 48: JUNOSe Software DSL Forum (Vendor ID 3561) VSA Formats

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-1]	Agent-Circuit-Id	Identifier for the subscriber agent circuit ID that corresponds to the DSLAM interface from which subscriber requests are initiated	len	sublen	string: agent-circuit-id
[26-2]	Agent-Remote-Id	Unique identifier for the subscriber associated with the DSLAM interface from which requests are initiated	len	sublen	string: agent-remote-id
[26-129]	Actual-Data-Rate-Upstream	Actual upstream data rate of the subscriber's synchronized DSL link	12	6	integer: 4-octet
[26-130]	Actual-Data-Rate-Downstream	Actual downstream data rate of the subscriber's synchronized DSL link	12	6	integer: 4-octet
[26-131]	Minimum-Data-Rate-Upstream	Minimum upstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-132]	Minimum-Data-Rate-Downstream	Minimum downstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-133]	Attainable-Data-Rate-Upstream	Upstream data rate that the subscriber can attain	12	6	integer: 4-octet
[26-134]	Attainable-Data-Rate-Downstream	Downstream data rate that the subscriber can attain	12	6	integer: 4-octet
[26-135]	Maximum-Data-Rate-Upstream	Maximum upstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-136]	Maximum-Data-Rate-Downstream	Maximum downstream data rate configured for the subscriber	12	6	integer: 4-octet
[26-137]	Minimum-Data-Rate-Upstream-Low-Power	Minimum upstream data rate in low power state configured for the subscriber	12	6	integer: 4-octet
[26-138]	Minimum-Data-Rate-Downstream-Low-Power	Minimum downstream data rate in low power state configured for the subscriber	12	6	integer: 4-octet
[26-139]	Maximum-Interleaving-Delay-Upstream	Maximum one-way upstream interleaving delay configured for the subscriber	12	6	integer: 4-octet
[26-140]	Actual-Interleaving-Delay-Upstream	Subscriber's actual one-way upstream interleaving delay	12	6	integer: 4-octet
[26-141]	Maximum-Interleaving-Delay-Downstream	Maximum one-way downstream interleaving delay configured for the subscriber	12	6	integer: 4-octet
[26-142]	Actual-Interleaving-Delay-Downstream	Subscriber's actual one-way downstream interleaving delay	12	6	integer: 4-octet

Table 48: JUNOSe Software DSL Forum (Vendor ID 3561) VSA Formats (continued)

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-144]	Access-Loop-Encapsulation	Encapsulation used by the subscriber associated with the DSLAM interface from which requests are initiated	11	5	string: 3-byte
[26-254]	IWF-Session	Indication that the interworking function (IWF) has been performed for the subscriber's session to enable the transport of PPP over ATM traffic on a PPPoE interface	8	2	No data field required

Pass Through RADIUS Attributes

Table 49 describes the RADIUS attribute that is not processed by JUNOSe software. The router simply passes this attribute to its destination.

Table 49: RADIUS Attribute Passed Through by JUNOSe Software

Standard Number	Attribute Name	Description
[79]	EAP-Message	■ Used by RADIUS relay servers ■ Passed through to the RADIUS server

References

For more information about RADIUS attributes, see the following RFCs:

- RFC 2661—Layer Two Tunneling Protocol "L2TP" (August 1999)
- RFC 2865—Remote Authentication Dial In User Service (RADIUS) (June 2000)
- RFC 2866—RADIUS Accounting (June 2000)
- RFC 2867—RADIUS Accounting Modifications for Tunnel Protocol Support (June 2000)
- RFC 2868—RADIUS Attributes for Tunnel Protocol Support (June 2000)
- RFC 2869—RADIUS Extensions (June 2000)
- RFC 3748—Extensible Authentication Protocol (EAP) (June 2004)
- RFC 4679—DSL Forum Vendor-Specific RADIUS Attributes (September 2006)

NOTE: IETF drafts are valid for only 6 months from the date of issuance. They must be considered as works in progress. Please refer to the IETF Web site at http://www.ietf.org for the latest drafts.

Chapter 7

Application Terminate Reasons

This chapter lists the default mappings for application terminate reasons to RADIUS Acct-Terminate-Cause attributes. Table 50 lists the default mappings for AAA, Table 51 lists default mappings for L2TP, Table 52 lists the default mappings for PPP, and Table 53 lists default mappings for RADIUS client. See *Mapping Application Terminate Reasons to RADIUS Terminate Codes* in *Chapter 1, Configuring Remote Access* for information about configuring custom mappings for application terminate reasons to RADIUS Acct-Terminate-Cause attributes.

AAA Terminate Reasons

Table 50 lists the default AAA terminate mappings. The table indicates the supported AAA terminate and deny reasons and the RADIUS Acct-Terminate-Cause attributes they are mapped to by default.

Table 50: Default AAA Mappings

AAA Shutdown or Deny Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
deny address allocation failure	17	user error
deny address assignment failure	17	user error
deny application error	17	user error
deny authentication denied	17	user error
deny authentication failure	17	user error
deny authorization failure	17	user error
deny incompatible request	17	user error
deny invalid tunnel configuration	17	user error
deny limit exceeded	17	user error
deny mixed user types	10	nas request
deny no access challenge support	17	user error

Table 50: Default AAA Mappings (continued)

AAA Shutdown or Deny Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
deny no address allocation resources	17	user error
deny no resources	10	nas request
deny redirected authentication failure	17	user error
deny server not available	17	user error
deny server request timeout	17	user error
deny terminating user	10	nas request
deny unknown subscriber	17	user error
deny user termination	17	user error
shutdown address lease expiration	10	nas request
shutdown administrative reset	6	admin reset

L2TP Terminate Reasons

Table 51 lists the default L2TP terminate mappings. The table indicates the supported L2TP terminate reasons and the RADIUS Acct-Terminate-Cause attributes they are mapped to by default.

Table 51: Default L2TP Mappings

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
session access interface down	8	port error
session admin close	6	admin reset
session admin drain	6	admin reset
session call down	10	nas request
session call failed	15	service unavailable
session create failed limit reached	9	nas error
session create failed no resources	9	nas error
session create failed single shot tunnel already fired	9	nas error
session create failed too busy	9	nas error
session failover protocol resync disconnect	6	admin reset
session hardware unavailable	8	port error
session no resources server port	9	nas error
session not ready	9	nas error
session rx cdn	10	nas request
session rx cdn avp bad hidden	10	nas request
session rx cdn avp bad value assigned session id	10	nas request
session rx cdn avp duplicate value assigned session id	10	nas request
session rx cdn avp malformed bad length	10	nas request

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
session rx cdn avp malformed truncated	10	nas request
session rx cdn avp missing mandatory assigned session id	10	nas request
session rx cdn avp missing mandatory result code	10	nas request
session rx cdn avp missing random vector	10	nas request
session rx cdn avp missing secret	10	nas request
session rx cdn avp unknown	10	nas request
session rx cdn no resources	10	nas request
session rx iccn avp bad hidden	10	nas request
session rx iccn avp bad value framing type	10	nas request
session rx iccn avp bad value proxy authen type	10	nas request
session rx iccn avp bad value unsupported proxy authen type	10	nas request
session rx iccn avp malformed bad length	10	nas request
session rx iccn avp malformed truncated	10	nas request
session rx iccn avp missing mandatory connect speed	10	nas request
session rx iccn avp missing mandatory framing type	10	nas request
session rx iccn avp missing mandatory proxy authen challenge	10	nas request
session rx iccn avp missing mandatory proxy authen id	10	nas request
session rx iccn avp missing mandatory proxy authen name	10	nas request
session rx iccn avp missing mandatory proxy authen response	10	nas request
session rx iccn avp missing random vector	10	nas request
session rx iccn avp missing secret	10	nas request
session rx iccn avp unknown	10	nas request
session rx iccn no resources	10	nas request
session rx iccn unexpected	10	nas request
session rx icrp avp bad hidden	10	nas request
session rx icrp avp bad value assigned session id	10	nas request
session rx icrp avp duplicate value assigned session id	10	nas request
session rx icrp avp malformed bad length	10	nas request
session rx icrp avp malformed truncated	10	nas request
session rx icrp avp missing mandatory assigned session id	10	nas request
session rx icrp avp missing random vector	10	nas request
session rx icrp avp missing secret	10	nas request
session rx icrp avp unknown	10	nas request
session rx icrp no resources	10	nas request
session rx icrp unexpected	10	nas request

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
session rx icrq admin close	6	admin reset
session rx icrq authenticate failed host	10	nas request
session rx icrq avp bad hidden	10	nas request
session rx icrq avp bad value assigned session id	10	nas request
session rx icrq avp bad value bearer type	10	nas request
session rx icrq avp bad value cisco nas port	10	nas request
session rx icrq avp duplicate value assigned session id	10	nas request
session rx icrq avp malformed bad length	10	nas request
session rx icrq avp malformed truncated	10	nas request
session rx icrq avp missing mandatory assigned session id	10	nas request
session rx icrq avp missing mandatory call serial number	10	nas request
session rx icrq avp missing random vector	10	nas request
session rx icrq avp missing secret	10	nas request
session rx icrq avp unknown	10	nas request
session rx icrq no resources	10	nas request
session rx icrq unexpected	10	nas request
session rx occn avp bad hidden	10	nas request
session rx occn avp bad value framing type	10	nas request
session rx occn avp malformed bad length	10	nas request
session rx occn avp malformed truncated	10	nas request
session rx occn avp missing mandatory connect speed	10	nas request
session rx occn avp missing mandatory framing type	10	nas request
session rx occn avp missing random vector	10	nas request
session rx occn avp missing secret	10	nas request
session rx occn avp unknown	10	nas request
session rx occn no resources	10	nas request
session rx occn unexpected	10	nas request
session rx ocrp avp bad hidden	10	nas request
session rx ocrp avp bad value assigned session id	10	nas request
session rx ocrp avp duplicate value assigned session id	10	nas request
session rx ocrp avp malformed bad length	10	nas request
session rx ocrp avp malformed truncated	10	nas request
session rx ocrp avp missing mandatory assigned session id	10	nas request
session rx ocrp avp missing random vector	10	nas request
session rx ocrp avp missing secret	10	nas request
session rx ocrp avp unknown	10	nas request
session rx ocrp no resources	10	nas request

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
session rx ocrp unexpected	10	nas request
session rx ocrq admin close	10	admin reset
session rx ocrq authenticate failed host	10	nas request
session rx ocrq avp bad hidden	10	nas request
session rx ocrq avp bad value assigned session id	10	nas request
session rx ocrq avp bad value bearer type	10	nas request
session rx ocrq avp bad value framing type	10	nas request
session rx ocrq avp duplicate value assigned session id	10	nas request
session rx ocrq avp malformed bad length	10	nas request
session rx ocrq avp malformed truncated	10	nas request
session rx ocrq avp missing mandatory assigned session id	10	nas request
session rx ocrq avp missing mandatory bearer type	10	nas request
session rx ocrq avp missing mandatory call serial number	10	nas request
session rx ocrq avp missing mandatory called number	10	nas request
session rx ocrq avp missing mandatory framing type	10	nas request
session rx ocrq avp missing mandatory maximum bps	10	nas request
session rx ocrq avp missing mandatory minimum bps	10	nas request
session rx ocrq avp missing random vector	10	nas request
session rx ocrq avp missing secret	10	nas request
session rx ocrq avp unknown	10	nas request
session rx ocrq no resources	10	nas request
session rx ocrq unexpected	10	nas request
session rx ocrq unsupported	9	nas error
session rx sli avp bad hidden	10	nas request
session rx sli avp bad value accm	10	nas request
session rx sli avp malformed bad length	10	nas request
session rx sli avp malformed truncated	10	nas request
session rx sli avp missing mandatory accm	10	nas request
session rx sli avp missing random vector	10	nas request
session rx sli avp missing secret	10	nas request
session rx sli avp unknown	10	nas request
session rx sli no resources	10	nas request
session rx unexpected packet lac incoming	10	nas request
session rx unexpected packet lac outgoing	10	nas request
session rx unexpected packet lns incoming	10	nas request
session rx unexpected packet lns outgoing	10	nas request
session rx unknown session id	10	nas request

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
session rx wen avp bad hidden	10	nas request
session rx wen avp malformed bad length	10	nas request
session rx wen avp malformed truncated	10	nas request
session rx wen avp missing mandatory call errors	10	nas request
session rx wen avp missing random vector	10	nas request
session rx wen avp missing secret	10	nas request
session rx wen avp unknown	10	nas request
session rx wen no resources	10	nas request
session timeout connection	10	nas request
session timeout inactivity	4	idle timeout
session timeout session	5	session timeout
session timeout upper create	9	nas error
session transmit speed unavailable	9	nas error
session tunnel down	15	service unavailable
session tunnel failed	15	service unavailable
session tunnel switch profile deleted	6	admin reset
session tunneled interface down	8	port error
session unknown cause	9	nas error
session upper create failed	9	nas error
session upper removed	15	service unavailable
session warmstart not operational	15	service unavailable
session warmstart recovery error	15	service unavailable
session warmstart upper not restacked	10	nas request
tunnel admin close	6	admin reset
tunnel admin drain	6	admin reset
tunnel control channel failed	15	service unavailable
tunnel created no sessions	1	user request
tunnel destination address changed	6	admin reset
tunnel destination down	10	nas request
tunnel failover protocol no resources for recovery tunnel	15	service unavailable
tunnel failover protocol no resources for session resync	15	service unavailable
tunnel failover protocol not supported	15	service unavailable
tunnel failover protocol not supported by peer	15	service unavailable
tunnel failover protocol recovery control channel failed	15	service unavailable
tunnel failover protocol recovery tunnel failed	15	service unavailable
tunnel failover protocol recovery tunnel finished	1	user request
tunnel failover protocol recovery tunnel primary down	1	user request

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
tunnel failover protocol session resync failed	15	service unavailable
tunnel host profile changed	6	admin reset
tunnel host profile deleted	6	admin reset
tunnel rx scccn authenticate failed challenge	17	user error
tunnel rx scccn avp bad hidden	15	service unavailable
tunnel rx scccn avp bad value challenge response	15	service unavailable
tunnel rx scccn avp malformed bad length	15	service unavailable
tunnel rx scccn avp malformed truncated	15	service unavailable
tunnel rx scccn avp missing challenge response	17	user error
tunnel rx scccn avp missing random vector	15	service unavailable
tunnel rx scccn avp missing secret	15	service unavailable
tunnel rx scccn avp unexpected challenge response	15	service unavailable
tunnel rx scccn avp unknown	15	service unavailable
tunnel rx scccn no resources	15	service unavailable
tunnel rx scccn session id not null	15	service unavailable
tunnel rx scccn unexpected	15	service unavailable
tunnel rx sccrp authenticate failed challenge	17	user error
tunnel rx sccrp authenticate failed host	17	user error
tunnel rx sccrp avp bad hidden	15	service unavailable
tunnel rx sccrp avp bad value assigned tunnel id	15	service unavailable
tunnel rx sccrp avp bad value bearer capabilities	15	service unavailable
tunnel rx sccrp avp bad value challenge	15	service unavailable
tunnel rx sccrp avp bad value challenge response	15	service unavailable
tunnel rx sccrp avp bad value failover capability	15	service unavailable
tunnel rx sccrp avp bad value framing capabilities	15	service unavailable
tunnel rx sccrp avp bad value protocol version	15	service unavailable
tunnel rx sccrp avp bad value receive window size	15	service unavailable
tunnel rx sccrp avp duplicate value assigned tunnel id	15	service unavailable
tunnel rx sccrp avp malformed bad length	15	service unavailable
tunnel rx sccrp avp malformed truncated	15	service unavailable
tunnel rx sccrp avp missing challenge response	17	user error
tunnel rx sccrp avp missing mandatory assigned tunnel id	15	service unavailable
tunnel rx sccrp avp missing mandatory framing capabilities	15	service unavailable
tunnel rx sccrp avp missing mandatory host name	15	service unavailable
tunnel rx sccrp avp missing mandatory protocol version	15	service unavailable
tunnel rx sccrp avp missing random vector	15	service unavailable
tunnel rx sccrp avp missing secret	15	service unavailable

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
tunnel rx sccrp avp unexpected challenge response	15	service unavailable
tunnel rx sccrp avp unexpected challenge without secret	15	service unavailable
tunnel rx sccrp avp unknown	15	service unavailable
tunnel rx sccrp no resources	15	service unavailable
tunnel rx sccrp session id not null	15	service unavailable
tunnel rx sccrp unexpected	15	service unavailable
tunnel rx sccrq admin close	6	admin reset
tunnel rx sccrq authenticate failed host	17	user error
tunnel rx sccrq avp bad hidden	15	service unavailable
tunnel rx sccrq avp bad value assigned tunnel id	15	service unavailable
tunnel rx sccrq avp bad value bearer capabilities	15	service unavailable
tunnel rx sccrq avp bad value challenge	15	service unavailable
tunnel rx sccrq avp bad value failover capability	15	service unavailable
tunnel rx sccrq avp bad value framing capabilities	15	service unavailable
tunnel rx sccrq avp bad value protocol version	15	service unavailable
tunnel rx sccrq avp bad value receive window size	15	service unavailable
tunnel rx sccrq avp duplicate value assigned tunnel id	15	service unavailable
tunnel rx sccrq avp malformed bad length	15	service unavailable
tunnel rx sccrq avp malformed truncated	15	service unavailable
tunnel rx sccrq avp missing mandatory assigned tunnel id	15	service unavailable
tunnel rx sccrq avp missing mandatory framing capabilities	15	service unavailable
tunnel rx sccrq avp missing mandatory host name	15	service unavailable
tunnel rx sccrq avp missing mandatory protocol version	15	service unavailable
tunnel rx sccrq avp missing random vector	15	service unavailable
tunnel rx sccrq avp missing secret	15	service unavailable
tunnel rx sccrq avp unexpected challenge without secret	15	service unavailable
tunnel rx sccrq avp unknown	15	service unavailable
tunnel rx sccrq bad address	15	service unavailable
tunnel rx sccrq no resources	15	service unavailable
tunnel rx sccrq no resources max tunnels	15	service unavailable
tunnel rx sccrq session id not null	15	service unavailable
tunnel rx sccrq unexpected	15	service unavailable
tunnel rx stopccn	1	user request
tunnel rx stopccn avp bad hidden	15	service unavailable
tunnel rx stopccn avp bad value assigned tunnel id	15	service unavailable
tunnel rx stopccn avp duplicate value assigned tunnel id	15	service unavailable
tunnel rx stopccn avp malformed bad length	15	service unavailable

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
tunnel rx stopccn avp malformed truncated	15	service unavailable
tunnel rx stopccn avp missing mandatory assigned tunnel id	15	service unavailable
tunnel rx stopccn avp missing mandatory result code	15	service unavailable
tunnel rx stopccn avp missing random vector	15	service unavailable
tunnel rx stopccn avp missing secret	15	service unavailable
tunnel rx stopccn avp unknown	15	service unavailable
tunnel rx stopccn no resources	15	service unavailable
tunnel rx stopccn session id not null	15	service unavailable
tunnel rx frs avp malformed truncated	15	service unavailable
tunnel rx frs avp missing mandatory failover session state	15	service unavailable
tunnel rx frs avp missing random vector	15	service unavailable
tunnel rx frs avp missing secret	15	service unavailable
tunnel rx frs avp unknown	15	service unavailable
tunnel rx frs no resources	15	service unavailable
tunnel rx frs session id not null	15	service unavailable
tunnel rx fsq avp bad hidden	15	service unavailable
tunnel rx fsq avp malformed bad length	15	service unavailable
tunnel rx fsq avp malformed truncated	15	service unavailable
tunnel rx fsq avp missing mandatory failover session state	15	service unavailable
tunnel rx fsq avp missing random vector	15	service unavailable
tunnel rx fsq avp missing secret	15	service unavailable
tunnel rx fsq avp unknown	15	service unavailable
tunnel rx fsq no resources	15	service unavailable
tunnel rx fsq session id not null	15	service unavailable
tunnel rx fsr avp bad hidden	15	service unavailable
tunnel rx fsr avp malformed bad length	15	service unavailable
tunnel rx unexpected packet	15	service unavailable
tunnel rx unexpected packet for session	15	service unavailable
tunnel rx unknown packet message type indecipherable	15	service unavailable
tunnel rx unknown packet message type unrecognized	15	service unavailable
tunnel rx recovery scccn authenticate failed challenge	17	user error
tunnel rx recovery scccn avp bad hidden	15	service unavailable
tunnel rx recovery scccn avp bad value challenge response	15	service unavailable
tunnel rx recovery scccn avp malformed bad length	15	service unavailable
tunnel rx recovery scccn avp malformed truncated	15	service unavailable
tunnel rx recovery scccn avp missing challenge response	17	user error
tunnel rx recovery scccn avp missing random vector	15	service unavailable

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
tunnel rx recovery scccn avp missing secret	15	service unavailable
tunnel rx recovery scccn avp unexpected challenge response	15	service unavailable
tunnel rx recovery scccn avp unknown	15	service unavailable
tunnel rx recovery scccn no resources	15	service unavailable
tunnel rx recovery scccn session id not null	15	service unavailable
tunnel rx recovery sccrp authenticate failed challenge	17	user error
tunnel rx recovery sccrp avp bad hidden	15	service unavailable
tunnel rx recovery sccrp avp bad value assigned tunnel id	15	service unavailable
tunnel rx recovery sccrp avp bad value bearer capabilities	15	service unavailable
tunnel rx recovery sccrp avp bad value challenge	15	service unavailable
tunnel rx recovery sccrp avp bad value challenge response	15	service unavailable
tunnel rx recovery sccrp avp bad value framing capabilities	15	service unavailable
tunnel rx recovery sccrp avp bad value protocol version	15	service unavailable
tunnel rx recovery sccrp avp bad value receive window size	15	service unavailable
tunnel rx recovery sccrp avp bad value suggested control sequence	15	service unavailable
tunnel rx recovery sccrp avp duplicate value assigned tunnel id	15	service unavailable
tunnel rx recovery sccrp avp malformed bad length	15	service unavailable
tunnel rx recovery sccrp avp malformed truncated	15	service unavailable
tunnel rx recovery sccrp avp mismatched host name	15	service unavailable
tunnel rx recovery sccrp avp mismatched vendor name	15	service unavailable
tunnel rx recovery sccrp avp missing challenge response	17	user error
tunnel rx recovery sccrp avp missing mandatory assigned tunnel id	15	service unavailable
tunnel rx recovery sccrp avp missing mandatory framing capabilities	15	service unavailable
tunnel rx recovery sccrp avp missing mandatory host name	15	service unavailable
tunnel rx recovery sccrp avp missing mandatory protocol version	15	service unavailable
tunnel rx recovery sccrp avp missing random vector	15	service unavailable
tunnel rx recovery sccrp avp missing secret	15	service unavailable
tunnel rx recovery sccrp avp unexpected challenge response	15	service unavailable
tunnel rx recovery sccrp avp unexpected challenge without secret	15	service unavailable
tunnel rx recovery sccrp avp unknown	15	service unavailable
tunnel rx recovery sccrp no resources	15	service unavailable
tunnel rx recovery sccrp session id not null	15	service unavailable
tunnel rx recovery sccrq admin close	6	admin reset

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
tunnel rx recovery sccrq avp bad hidden	15	service unavailable
tunnel rx recovery sccrq avp bad value assigned tunnel id	15	service unavailable
tunnel rx recovery sccrq avp bad value bearer capabilities	15	service unavailable
tunnel rx recovery sccrq avp bad value challenge	15	service unavailable
tunnel rx recovery sccrq avp bad value framing capabilities	15	service unavailable
tunnel rx recovery sccrq avp bad value protocol version	15	service unavailable
tunnel rx recovery sccrq avp bad value receive window size	15	service unavailable
tunnel rx recovery sccrq avp bad value tunnel recovery	15	service unavailable
tunnel rx recovery sccrq avp duplicate value assigned tunnel id	15	service unavailable
tunnel rx recovery sccrq avp duplicate value tie breaker	15	service unavailable
tunnel rx recovery sccrq avp malformed bad length	15	service unavailable
tunnel rx recovery sccrq avp malformed truncated	15	service unavailable
tunnel rx recovery sccrq avp mismatched host name	15	service unavailable
tunnel rx recovery sccrq avp mismatched vendor name	15	service unavailable
tunnel rx recovery sccrq avp missing mandatory assigned tunnel id	15	service unavailable
tunnel rx recovery sccrq avp missing mandatory framing capabilities	15	service unavailable
tunnel rx recovery sccrq avp missing mandatory host name	15	service unavailable
tunnel rx recovery sccrq avp missing mandatory protocol version	15	service unavailable
tunnel rx recovery sccrq avp missing mandatory tunnel recovery	15	service unavailable
tunnel rx recovery sccrq avp missing random vector	15	service unavailable
tunnel rx recovery sccrq avp missing secret	15	service unavailable
tunnel rx recovery sccrq avp missing tie breaker	15	service unavailable
tunnel rx recovery sccrq avp unexpected challenge without secret	15	service unavailable
tunnel rx recovery sccrq avp unknown	15	service unavailable
tunnel rx recovery sccrq no resources	15	service unavailable
tunnel rx recovery sccrq session id not null	15	service unavailable
tunnel rx recovery sccrq tunnel id not null	15	service unavailable
tunnel rx recovery stopccn avp bad hidden	15	service unavailable
tunnel rx recovery stopccn avp bad value assigned tunnel id	15	service unavailable
tunnel rx recovery stopccn avp duplicate value assigned tunnel id	15	service unavailable
tunnel rx recovery stopccn avp malformed bad length	15	service unavailable
tunnel rx recovery stopccn avp malformed truncated	15	service unavailable

Table 51: Default L2TP Mappings (continued)

L2TP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
tunnel rx recovery stopccn avp missing mandatory assigned tunnel id	15	service unavailable
tunnel rx recovery stopccn avp missing mandatory result code	15	service unavailable
tunnel rx recovery stopccn avp missing random vector	15	service unavailable
tunnel rx recovery stopccn avp missing secret	15	service unavailable
tunnel rx recovery stopccn avp unknown	15	service unavailable
tunnel rx recovery stopccn no resources	15	service unavailable
tunnel rx recovery stopccn session id not null	15	service unavailable
tunnel rx recovery unexpected packet	15	service unavailable
tunnel rx recovery unknown packet message type indecipherable	15	service unavailable
tunnel rx recovery unknown packet message type unrecognized	15	service unavailable
tunnel rx session packet null sid invalid	15	service unavailable
tunnel rx session packet null sid without assigned session id	15	service unavailable
tunnel timeout connection	15	service unavailable
tunnel timeout connection recovery tunnel	15	service unavailable
tunnel timeout idle	1	user request
tunnel unknown cause	9	nas error
tunnel warmstart not operational	15	service unavailable
tunnel warmstart recovery error	15	service unavailable

PPP Terminate Reasons

Table 52 lists the default PPP terminate mappings. The table indicates the supported PPP terminate reasons and the RADIUS Acct-Terminate-Cause attributes they are mapped to by default.

Table 52: Default PPP Mappings

PPP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
authenticate authenticator timeout	17	user error
authenticate challenge timeout	10	nas request
authenticate chap no resources	10	nas request
authenticate chap peer authenticator timeout	17	user error
authenticate deny by peer	17	user error
authenticate inactivity timeout	4	idle timeout
authenticate max requests	10	nas request
authenticate no authenticator	10	nas request

Table 52: Default PPP Mappings (continued)

PPP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
authenticate pap peer authenticator timeout	17	user error
authenticate pap request timeout	10	nas request
authenticate session timeout	5	session timeout
authenticate too many requests	10	nas request
authenticate tunnel fail immediate	10	nas request
authenticate tunnel unsupported tunnel type	10	nas request
bundle fail create	10	nas request
bundle fail engine add	10	nas request
bundle fail fragment size mismatch	10	nas request
bundle fail fragmentation location	10	nas request
bundle fail fragmentation mismatch	10	nas request
bundle fail join	10	nas request
bundle fail link selection mismatch	10	nas request
bundle fail local mped not set yet	10	nas request
bundle fail local mrru mismatch	10	nas request
bundle fail local mru mismatch	10	nas request
bundle fail peer mrru mismatch	10	nas request
bundle fail reassembly location	10	nas request
bundle fail reassembly mismatch	10	nas request
bundle fail record network	10	nas request
bundle fail server location mismatch	10	nas request
bundle fail static link	10	nas request
failover during authentication	6	admin reset
interface admin disable	6	admin reset
interface down	2	lost carrier
interface no hardware	8	port error
ip admin disable	10	nas request
ip inhibited by authentication	10	nas request
ip link down	10	nas request
ip max configure exceeded	10	nas request
ip no local ip address	10	nas request
ip no local ip address mask	10	nas request
ip no local primary dns address	10	nas request
ip no local primary nbns address	10	nas request
ip no local secondary dns address	10	nas request
ip no local secondary nbns address	10	nas request
ip no peer ip address	10	nas request

Table 52: Default PPP Mappings (continued)

PPP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
ip no peer ip address mask	10	nas request
ip no peer primary dns address	10	nas request
ip no peer primary nbns address	10	nas request
ip no peer secondary dns address	10	nas request
ip no peer secondary nbns address	10	nas request
ip no service	10	nas request
ip peer renegotiate rx conf ack	10	nas request
ip peer renegotiate rx conf nak	10	nas request
ip peer renegotiate rx conf rej	10	nas request
ip peer renegotiate rx conf req	10	nas request
ip peer terminate term ack	10	nas request
ip peer terminate code rej	10	nas request
ip peer terminate term req	10	nas request
ip service disable	10	nas request
ip stale stacking	10	nas request
ipv6 admin disable	10	nas request
ipv6 inhibited by authentication	10	nas request
ipv6 link down	10	nas request
ipv6 local and peer interface ids identical	10	nas request
ipv6 max configure exceeded	10	nas request
ipv6 no local ipv6 interface id	10	nas request
ipv6 no peer ipv6 interface id	10	nas request
ipv6 no service	10	nas request
ipv6 peer renegotiate rx conf ack	10	nas request
ipv6 peer renegotiate rx conf nak	10	nas request
ipv6 peer renegotiate rx conf rej	10	nas request
ipv6 peer renegotiate rx conf req	10	nas request
ipv6 peer terminate code rej	10	nas request
ipv6 peer terminate term ack	10	nas request
ipv6 peer terminate term req	10	nas request
ipv6 service disable	10	nas request
ipv6 stale stacking	10	nas request
lcp authenticate terminate hold	10	nas request
lcp configured mrru too small	10	nas request
lcp configured mru invalid	10	nas request
lcp configured mru too small	10	nas request
lcp dynamic interface hold	10	nas request

Table 52: Default PPP Mappings (continued)

PPP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
lcp keepalive failure	10	nas request
lcp loopback rx conf req	10	nas request
lcp loopback rx echo reply	10	nas request
lcp loopback rx echo req	10	nas request
lcp max configure exceeded	10	nas request
lcp mru changed	10	nas request
lcp negotiation timeout	10	nas request
lcp no localaccm	10	nas request
lcp no localacfc	10	nas request
lcp no local authentication	10	nas request
lcp no local endpoint discriminator	10	nas request
lcp no local magic number	10	nas request
lcp no local mrru	10	nas request
lcp no local mru	10	nas request
lcp no localpfc	10	nas request
lcp no peer accm	10	nas request
lcp no peer authentication	10	nas request
lcp no peer endpoint discriminator	10	nas request
lcp no peer magicnumber	10	nas request
lcp no peer mrru	10	nas request
lcp no peer mru	10	nas request
lcp no peer pfc	10	nas request
lcp peer terminate code rej	1	user request
lcp peer terminate term ack	1	user request
lcp peer terminate term req	1	user request
lcp peer terminate protocol reject	1	user request
lcp peer renegotiate rx conf ack	1	user request
lcp peer renegotiate rx conf nak	1	user request
lcp peer renegotiate rx conf rej	1	user request
lcp peer renegotiate rx conf req	1	user request
lcp tunnel disconnected	10	nas request
lcp tunnel failed	10	nas request
link interface no hardware	8	port error
lower interface attach failed	2	lost carrier
lower interface teardown	2	lost carrier
mpls admin disable	10	nas request
mpls link down	10	nas request

Table 52: Default PPP Mappings (continued)

PPP Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
mpls max configure exceeded	10	nas request
mpls no service	10	nas request
mpls peer renegotiate rx conf ack	10	nas request
mpls peer renegotiate rx conf nak	10	nas request
mpls peer renegotiate rx conf rej	10	nas request
mpls peer renegotiate rx conf req	10	nas request
mpls peer terminate code rej	10	nas request
mpls peer terminate term ack	10	nas request
mpls peer terminate term req	10	nas request
mpls service disable	10	nas request
mpls stale stacking	10	nas request
network interface admin disable	6	admin reset
no bundle	10	nas request
no interface	8	port error
no link interface	8	port error
no ncps available	10	nas request
no network interface	10	nas request
no upper interface	9	nas error
osi admin disable	10	nas request
osi link down	10	nas request
osi max configure exceeded	10	nas request
osi no local align npdu	10	nas request
osi no peer align npdu	10	nas request
osi no service	10	nas request
osi peer renegotiate rx conf ack	10	nas request
osi peer renegotiate rx conf nak	10	nas request
osi peer renegotiate rx conf rej	10	nas request
osi peer renegotiate rx conf req	10	nas request
osi peer terminate code rej	10	nas request
osi peer terminate term ack	10	nas request
osi peer terminate term req	10	nas request
osi service disable	10	nas request
osi stale stacking	10	nas request

RADIUS Client Terminate Reasons

Table 53 lists the default RADIUS client terminate mappings. The table indicates the supported RADIUS client terminate reasons and the RADIUS Acct-Terminate-Cause attributes they are mapped to by default.

Table 53: Default RADIUS Client Mappings

RADIUS Client Terminate Reason	RADIUS Acct-Terminate-Cause	
	Code	Description
no-acct-server	10	nas request
system-reboot	10	nas request
virtual-router-deletion	10	nas request

Chapter 8

Monitoring RADIUS

This chapter describes how to monitor the RADIUS attributes, RADIUS dynamic-request server, and RADIUS relay.

RADIUS topics are described in the following sections:

Monitoring Override Settings of RADIUS IETF Attributes

Purpose Display the current override setting for RADIUS IETF attributes. You can monitor the NAS-IP-Address [4], NAS-Port-Id [87], Calling-Station-Id [31], and NAS-Identifier [32] attributes.

Action To display the current setting for all configured RADIUS attributes:

```
host1#show radius override
nas-ip-addr:          nas-ip-addr
nas-port-id:           nas-port-id
calling-station-id:   calling-station-id
nas-info:              from current virtual router

host1#show radius override
nas-ip-addr: nas-ip-addr
nas-info:     from authentication virtual router
```

Meaning Table 54 lists the **show radius override** command output fields.

Table 54: show radius override Output Fields

Field Name	Field Description
nas-ip-addr	Displays the current setting for the NAS-IP-Address [4] attribute. These settings can be changed with the **radius override nas-ip-addr tunnel-client-endpoint** and **radius override nas-info** commands.
nas-port-id	Displays the current setting for the NAS-Port-Id [87] attribute. Use the **radius override nas-port-id remote-circuit-id** command to override the standard NAS-Port-Id attribute with the PPPoE remote circuit ID transmitted from the DSLAM.
calling-station-id	Displays the current setting for the Calling-Station-Id [31] attribute. Use the **radius override calling-station-id remote-circuit-id** command to override the standard Calling-Station-Id attribute with the PPPoE remote circuit ID transmitted from the DSLAM.
nas-info	Displays the current setting for the NAS-Identifier [32] attribute. This setting can be changed with the **radius override nas-info** command, which is used for AAA broadcast accounting.

Related Topics

- **show radius override** command

Monitoring the NAS-Port-Format RADIUS Attribute

Purpose Display information for the NAS-Port attribute.

Action To display the setting for the NAS-Port attribute:

```
host1#show radius nas-port-format
Osssppp
```

To display information about the NAS-Port attribute on an ATM interface on an E320 router:

```
host1#show radius nas-port-format extended atm
extended atm field-width slot 5 adapter 0 port 4 vpi 4 vci 12
```

To display the status of NAS-Port attribute settings for PPPoE interfaces:

```
host1#show radius pppoe nas-port-format
unique
```

To display the status of the S-VLAN ID setting for the NAS-Port attribute for VLAN interfaces:

```
host1#show radius vlan nas-port-format
vlan stacked
```

Related Topics

- **show radius nas-port-format** command
- **show radius nas-port-format extended** command
- **show radius pppoe nas-port-format** command
- **show radius vlan nas-port-format** command

Monitoring the Calling-Station-Id RADIUS Attribute

Purpose Display the format and delimiter used for the Calling-Station-Id [31] attribute.

Action To display the format configured for the Calling-Station-Id [31] attribute:

```
host1#show radius calling-station-format
fixed-format-adapter-new-field
```

To display the delimiter used in the Calling-Station-Id for authenticated ATM PPP users:

```
host1#show radius calling-station-delimiter
&
```

Related Topics

- **show radius calling-station-format** command
- **show radius calling-station-delimiter** command

Monitoring the NAS-Identifier RADIUS Attribute

Purpose Display information about the NAS-Identifier value.

Action To display information about the NAS-Identifier value:

```
host1#show radius nas-identifier
fox
```

Related Topics

- **show radius nas-identifier** command

Monitoring the Format of the Remote-Circuit-ID for RADIUS

Purpose Display the format configured for the PPPoE remote circuit ID value captured from a DSLAM.

The default format is agent-circuit-ID. If the PPPoE remote circuit ID value is configured to include any or all of the agent-circuit-id, agent-remote-id, and nas-identifier components, the display lists the components included and the order in which they appear.

If the PPPoE remote circuit ID value is configured to use the format for the **dsl-forum-1** keyword of the **radius remote-circuit-id-format** command, the display indicates that this format is in effect.

Action To display the format configured for the PPPoE remote circuit ID value captured from a DSLAM:

```
host1#show radius remote-circuit-id-format
nas-identifier agent-circuit-id agent-remote-id
```

Related Topics

- [32] NAS-Identifier
- **show radius remote-circuit-id-format** command

Monitoring the Delimiter Character in the Remote-Circuit-ID for RADIUS

Purpose Display the delimiter character configured to set off components in the PPPoE remote circuit ID value captured from a DSLAM. The default delimiter character is #.

Action To display the delimiter character:

```
host1#show radius remote-circuit-id-delimiter
!
```

Related Topics

- **show radius remote-circuit-id-delimiter** command

Monitoring the Acct-Session-Id RADIUS Attribute

Purpose Display the format used for the Acct-Session-Id attribute.

Action To display the format used for the Acct-Session-Id attribute:

```
host1#show radius acct-session-id-format
decimal
```

Related Topics

- **show radius acct-session-id-format** command

Monitoring the DSL-Port-Type RADIUS Attribute

Purpose Display the DSL port type for NAS-Port-Type attribute for ATM and Ethernet users.

Action To display the DSL port type for NAS-Port-Type attribute for ATM users:

```
host1#show radius dsl-port-type
xdsl
```

To display the NAS-Port-Type attribute for Ethernet interfaces:

```
host1#show radius ethernet-port-type
virtual
```

Related Topics

- **show radius dsl-port-type** command
- **show radius ethernet-port-type** command

Monitoring the Connect-Info RADIUS Attribute

Purpose Display the format for the Connect-Info attribute.

Action To display the format for the Connect-Info attribute:

```
host1(config)#show radius connect-info-format
l2tp-connect-speed-rx-when-equal
```

Related Topics

- **show radius connect-info-format** command

Monitoring the NAS-Port-ID RADIUS Attribute

Purpose Display whether the router includes or excludes the subinterface number or adapter in the interface description that the router passes to RADIUS for inclusion in the NAS-Port-Id attribute.

Action To display information about the interface description for the NAS-Port-ID:

```
host1#show aaa intf-desc-format
exclude sub-interface
include adapter
```

Related Topics

- **show aaa intf-desc-format** command

Monitoring Included RADIUS Attributes

Purpose Display the RADIUS attributes that are included in and excluded from Acct-On, Acct-Off, Access-Request, Acct-Start, and Acct-Stop messages.

Action To display the list of included RADIUS attributes:

```
host1#show radius attributes-included
                          Account   Account    Access    Account    Account
      Attribute Name        On        Off     Request     Start      Stop
--------------------------  -------   -------  --------  --------  --------
acct-authentic              enabled   enabled  n/c       n/c       n/c
acct-delay-time             enabled   enabled  n/c       n/c       n/c
acct-link-count             n/c       n/c      n/c       enabled   enabled
acct-multi-session-id       n/c       n/c      disabled  enabled   enabled
acct-session-id             enabled   enabled  enabled   n/c       n/c
acct-terminate-cause        n/c       enabled  n/c       n/c       n/c
acct-tunnel-connection      n/c       n/c      enabled   enabled   enabled
ascend-num-in-multilink     n/c       n/c      disabled  disabled  disabled
called-station-id           n/c       n/c      enabled   enabled   enabled
calling-station-id          n/c       n/c      enabled   enabled   enabled
class                       n/c       n/c      n/c       enabled   enabled
connect-info                n/c       n/c      enabled   enabled   enabled
dhcp-options                n/c       n/c      disabled  disabled  disabled
dhcp-mac-address            n/c       n/c      disabled  disabled  disabled
dhcp-gi-address             n/c       n/c      disabled  disabled  disabled
dsl-forum-attributes        n/c       n/c      disabled  disabled  disabled
egress-policy-name(vsa)     n/c       n/c      n/c       enabled   enabled
event-timestamp             enabled   enabled  n/c       enabled   enabled
framed-compression          n/c       n/c      n/c       enabled   enabled
framed-interface-id         n/c       n/c      n/c       disabled  disabled
framed-ip-address           n/c       n/c      n/c       enabled   enabled
framed-ip-netmask           n/c       n/c      n/c       enabled   enabled
framed-ipv6-prefix          n/c       n/c      n/c       disabled  disabled
ingress-policy-name(vsa)    n/c       n/c      n/c       enabled   enabled
input-gigapkts(vsa)         n/c       n/c      n/c       n/c       enabled
input-gigawords             n/c       n/c      n/c       n/c       enabled
interface-description       n/c       n/c      enabled   enabled   enabled
l2c-downstream-data(vsa)    n/c       n/c      disabled  disabled  disabled
l2c-upstream-data(vsa)      n/c       n/c      disabled  disabled  disabled
l2cd-acc-loop-cir-id(vsa)   n/c       n/c      disabled  disabled  disabled
```

```
l2cd-acc-aggr-cir-id-bin(vsa)  n/c       n/c       disabled   disabled   disabled
l2cd-acc-aggr-cir-id-asc(vsa)  n/c       n/c       disabled   disabled   disabled
l2cd-act-data-rate-up(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-act-data-rate-dn(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-min-data-rate-up(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-min-data-rate-dn(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-att-data-rate-up(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-att-data-rate-dn(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-max-data-rate-up(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-max-data-rate-dn(vsa)     n/c       n/c       disabled   disabled   disabled
l2cd-min-lp-data-rate-up(vsa)  n/c       n/c       disabled   disabled   disabled
l2cd-min-lp-data-rate-dn(vsa)  n/c       n/c       disabled   disabled   disabled
l2cd-max-interlv-delay-up(vsa) n/c       n/c       disabled   disabled   disabled
l2cd-act-interlv-delay-up(vsa) n/c       n/c       disabled   disabled   disabled
l2cd-max-interlv-delay-dn(vsa) n/c       n/c       disabled   disabled   disabled
l2cd-act-interlv-delay-dn(vsa) n/c       n/c       disabled   disabled   disabled
l2cd-dsl-line-state(vsa)       n/c       n/c       disabled   disabled   disabled
l2cd-dsl-type(vsa)             n/c       n/c       disabled   disabled   disabled
l2tp-ppp-disconnect-cause      n/c       n/c       n/c        n/c        disabled
mlppp-bundle-name              n/c       n/c       enabled    enabled    enabled
nas-identifier                 enabled   enabled   enabled    enabled    enabled
nas-port                       n/c       n/c       enabled    enabled    enabled
nas-port-id                    n/c       n/c       enabled    enabled    enabled
nas-port-type                  n/c       n/c       enabled    enabled    enabled
output-gigapkts(vsa)           n/c       n/c       n/c        n/c        enabled
output-gigawords               n/c       n/c       n/c        n/c        enabled
pppoe-description(vsa)         n/c       n/c       enabled    enabled    enabled
profile-service-descr(vsa)     n/c       n/c       disabled   disabled   disabled
tunnel-assignment-id           n/c       n/c       n/c        enabled    enabled
tunnel-client-auth-id          n/c       n/c       enabled    enabled    enabled
tunnel-client-endpoint         n/c       n/c       enabled    enabled    enabled
tunnel-interface-id            n/c       n/c       disabled   disabled   disabled
tunnel-medium-type             n/c       n/c       enabled    enabled    enabled
tunnel-preference              n/c       n/c       n/c        enabled    enabled
tunnel-server-attributes       n/c       n/c       disabled   disabled   disabled
tunnel-server-auth-id          n/c       n/c       enabled    enabled    enabled
tunnel-server-endpoint         n/c       n/c       enabled    enabled    enabled
tunnel-type                    n/c       n/c       enabled    enabled    enabled
```

Meaning Table 55 lists the **show radius attributes-included** command output fields.

Table 55: show radius attributes-included Output Fields

Field Name	Field Description
Attribute Name	Name of the RADIUS attribute
Account On	Include status of the attribute in Acct-On messages: enabled, disabled, not configurable (n/c)
Account Off	Include status of the attribute in Acct-Off messages: enabled, disabled, n/c
Access Request	Include status of the attribute in Access Request messages: enabled, disabled, n/c
Account Start	Include status of the attribute in Acct-Start messages: enabled, disabled, n/c
Account Stop	Include status of the attribute in Acct-Stop messages: enabled, disabled, n/c

Related Topics

- **show radius attributes-included** command

Monitoring Ignored RADIUS Attributes

Purpose Display the RADIUS attributes that are ignored in Access-Accept messages.

Action To display the RADIUS attributes that are ignored:

```
host1#show radius attributes-ignored
attribute framed-ip-netmask ignored from RADIUS server
attribute atm-category (vsa) ignored from RADIUS server
attribute atm-mbs (vsa) accepted from RADIUS server
attribute atm-pcr (vsa) ignored from RADIUS server
attribute atm-scr (vsa) accepted from RADIUS server
attribute egress-policy-name (vsa) accepted from RADIUS server
attribute ingress-policy-name (vsa) accepted from RADIUS server
attribute virtual-router accepted from RADIUS server
```

Related Topics

- **show radius attributes-ignored** command

Setting the Baseline for RADIUS Dynamic-Request Server Statistics

You can set a statistics baseline for packet mirroring-related RADIUS statistics. To show baseline statistics, use the **delta** keyword with the **show radius dynamic-request statistics** command.

To set a baseline for RADIUS statistics for packet mirroring:

- Issue the **baseline radius dynamic-request** command:

  ```
  host1#baseline radius dynamic-request
  ```

There is no **no** version.

Related Topics

- Monitoring RADIUS Dynamic-Request Server Statistics on page 253
- **baseline radius dynamic-request** command

Monitoring RADIUS Dynamic-Request Server Statistics

Purpose Display RADIUS dynamic-request server statistics.

Action To display RADIUS dynamic-request statistics:

```
host1#show radius dynamic-request statistics

       RADIUS Request Statistics
       -------------------------
          Statistic              10.10.3.4
-----------------------------    -------
UDP Port                         1700
Disconnect Requests              0
Disconnect Accepts               0
Disconnect Rejects               0
Disconnect No Session ID         0
Disconnect Bad Authenticators    0
Disconnect Packets Dropped       0
CoA Requests                     0
CoA Accepts                      0
CoA Rejects                      0
CoA No Session ID                0
CoA Bad Authenticators           0
CoA Packets Dropped              0
No Secret                        0
Unknown Request                  0

Invalid Addresses Received  :0
```

Meaning Table 56 lists the **show radius dynamic-request statistics** command output fields.

Table 56: show radius dynamic-request statistics Output Fields

Field Name	Field Description
Udp Port	Port on which the router listens for RADIUS server
Disconnect or CoA Requests	RADIUS-initiated disconnect or CoA requests received
Disconnect or CoA Accepts	RADIUS-initiated disconnect or CoA requests accepted
Disconnect or CoA Rejects	RADIUS-initiated disconnect or CoA requests rejected
Disconnect or CoA No Session ID	RADIUS-initiated disconnect or CoA messages rejected because the request did not include a session ID attribute
Disconnect or CoA Bad Authenticators	RADIUS-initiated disconnect or CoA messages rejected because the calculated authenticator in the authenticator field of the request did not match
Disconnect or CoA Packets Dropped	RADIUS-initiated disconnect or CoA packets dropped because of queue overflow
No Secret	Messages rejected because a secret was not present in the authenticator field
Unknown Requests	Packets received with an invalid RADIUS code for RADIUS disconnect or change of authorization
Invalid Addresses Received	Number of invalid addresses received

Related Topics

- Setting the Baseline for RADIUS Dynamic-Request Server Statistics on page 252
- **show radius statistics** command

Monitoring the Configuration of the RADIUS Dynamic-Request Server

Purpose Display the configuration of the RADIUS dynamic-request server.

Action To display the configuration of the RADIUS dynamic-request server:

```
host1#show radius dynamic-request servers

                RADIUS Request Configuration
                ----------------------------
                                          Change
                 Udp                        Of
 IP Address      Port   Disconnect   Authorization   Secret
-------------    ----   ----------   -------------   ------
192.168.2.3      1700   disabled     disabled        <NULL>
10.10.120.104    1700   disabled     disabled        mysecret
```

Meaning Table 57 lists the **show radius server dynamic-request** command output fields.

Table 57: show radius server dynamic-request Output Fields

Field Name	Field Description
IP address	IP address of the RADIUS server
Udp Port	Port on which the router listens for RADIUS server
Disconnect	Status of RADIUS-initiated disconnect feature
Change of Authorization	Status of change of authorization feature
Secret	Secret used to connect to RADIUS server

Related Topics

- **show radius servers** command

Setting a Baseline for RADIUS Relay Statistics

You can set a baseline for RADIUS relay statistics. To show baseline statistics, use the **delta** keyword with the **show radius relay** command.

To set a baseline for RADIUS relay statistics:

- Issue the **baseline radius relay** command:

  host1#**baseline radius relay**

There is no **no** version.

Related Topics

- Monitoring RADIUS Relay Server Statistics on page 255
- **baseline radius relay** command

Monitoring RADIUS Relay Server Statistics

Purpose Display RADIUS relay server statistics.

Action To show RADIUS relay server statistics that were baselined:

```
host1#show radius relay statistics delta

RADIUS Relay Authentication Server Statistics
---------------------------------------------
    Statistic        Total
------------------   -----
Access Requests      1000
Access Accepts       1000
Access Challenges    0
Access Rejects       0
Pending Requests     0
Duplicate Requests   0
Malformed Requests   0
Bad Authenticators   0
Unknown Requests     0
Dropped Packets      0
Invalid Requests     0
Statistics baseline set FRI APR 02 2004 19:01:52 UTC

RADIUS Relay Accounting Server Statistics
-----------------------------------------
     Statistic         Total
-------------------   -----
Accounting Requests    1000
    Start              1000
    Stop               0
    Interim            0
Accounting Responses   1000
    Start              1000
    Stop               0
    Interim            0
Pending Requests       0
Duplicate Requests     0
Malformed Requests     0
Bad Authenticators     0
Unknown Requests       0
Dropped Packets        0
Invalid Requests       0
Statistics baseline set FRI APR 02 2004 19:01:52 UTC
```

Meaning Table 58 lists the **show radius relay statistics** command output fields.

Table 58: show radius relay statistics Output Fields

Field Name	Field Description
Access Requests	Number of access requests received
Access Accepts	Number of access accepts received

Table 58: show radius relay statistics Output Fields (continued)

Field Name	Field Description
Access Challenges	Number of access challenges received
Access Rejects	Number of access rejects received
Pending Requests	Number of access requests waiting for a response
Duplicate Requests	Number of duplicate requests received while the previous request is pending
Malformed Requests	Requests with attributes having an invalid length or unexpected attributes
Bad Authenticators	Authenticator in the response is incorrect for the matching request; can occur if the secret for the RADIUS relay server and the WAP does not match
Unknown Requests	Packets received from nonconfigured clients
Dropped Packets	Packets dropped because of queue overflow
Invalid Requests	Number of invalid requests received
Accounting Requests	Number of accounting requests received, broken down by type of request
Accounting Responses	Number of accounting responses, broken down by type of request

Related Topics

- Setting a Baseline for RADIUS Relay Statistics on page 254
- **show radius relay statistics** command

Monitoring the Configuration of the RADIUS Relay Server

Purpose Display information about the RADIUS relay server configuration.

Action To display the RADIUS relay server configuration:

```
host1#show radius relay servers

RADIUS Relay Authentication Server Configuration
------------------------------------------------
 IP Address         IP Mask        Secret
-------------   ---------------   ---------
10.10.8.15      255.255.255.255   newsecret
192.168.102.5   255.255.255.255   999Y2K
Udp Port: 1812

RADIUS Relay Accounting Server Configuration
--------------------------------------------
 IP Address         IP Mask       Secret
-------------   ---------------   -------
10.10.1.0       255.255.255.0     NO8pxq
192.168.102.5   255.255.255.255   12BE$56
Udp Port: 1813
```

Meaning Table 59 lists the **show radius relay servers** command output fields.

Table 59: show radius relay servers Output Fields

Field Name	Field Description
IP Address	Address of the RADIUS relay server
IP Mask	Mask of the RADIUS relay server
Secret	Secret used for exchanges between the RADIUS relay server and client
Udp Port	Router's port on which the RADIUS relay server listens

Related Topics

- **show radius relay servers** command

Monitoring the Status of RADIUS Relay UDP Checksums

Purpose Display status of RADIUS relay UDP checksums.

Action To display the status of UDP checksums:

```
host1(config)#show radius relay udp-checksum
udp-checksums enabled
```

Meaning Table 60 lists the **show radius relay udp-checksum** command output fields.

Table 60: show radius relay udp-checksum Output Fields

Field Name	Field Description
udp-checksums	Status of UDP checksums: enabled or disabled

Related Topics

- **show radius relay udp-checksum** command

Chapter 9

Configuring TACACS+

This chapter explains how to enable and configure TACACS+ in your E-series router. It has the following sections:

Overview

With the increased use of remote access, the need for managing more network access servers (NAS) has increased. Additionally, the need for control access on a per-user basis has escalated, as has the need for central administration of users and passwords.

Terminal Access Controller Access Control System (TACACS) is a security protocol that provides centralized validation of users who are attempting to gain access to a router or NAS. TACACS+, a more recent version of the original TACACS protocol, provides separate authentication, authorization, and accounting (AAA) services.

NOTE: TACACS+ is a completely new protocol and is not compatible with TACACS or XTACACS.

The TACACS+ protocol provides detailed accounting information and flexible administrative control over the authentication, authorization, and accounting process. The protocol allows a TACACS+ client to request detailed access control and allows the TACACS+ process to respond to each component of that request. TACACS+ uses Transmission Control Protocol (TCP) for its transport.

TACACS+ provides security by encrypting all traffic between the NAS and the process. Encryption relies on a secret key that is known to both the client and the TACACS+ process.

Table 61 describes terms that are frequently used in this chapter.

Table 61: TACACS-Related Terms

Term	Description
NAS	Network access server. A device that provides connections to a single user, to a network or subnetwork, and to interconnected networks. In reference to TACACS+, the NAS is the E-series router.
TACACS+ process	A program or software running on a security server that provides AAA services using the TACACS+ protocol. The program processes authentication, authorization, and accounting requests from an NAS. When processing authentication requests, the process might respond to the NAS with a request for additional information, such as a password.
TACACS+ host	The security server on which the TACACS+ process is running. Also referred to as a TACACS+ server.

AAA Overview

TACACS+ allows effective communication of AAA information between NASs and a central server. The separation of the AAA functions is a fundamental feature of the TACACS+ design:

- Authentication—Determines who a user is, then determines whether that user should be granted access to the network. The primary purpose is to prevent intruders from entering your networks. Authentication uses a database of users and passwords.

- Authorization—Determines what an authenticated user is allowed to do. Authorization gives the network manager the ability to limit network services to different users. Also, the network manager can limit the use of certain commands to various users. Authorization cannot occur without authentication.

- Accounting—Tracks what a user did and when it was done. Accounting can be used for an audit trail or for billing for connection time or resources used. Accounting can occur independent of authentication and authorization.

Central management of AAA means that the information is in a single, centralized, secure database, which is much easier to administer than information distributed across numerous devices. Both RADIUS and TACACS+ protocols are client-server systems that allow effective communication of AAA information.

For information about RADIUS, see *Chapter 1, Configuring Remote Access* and *Chapter 3, Configuring RADIUS Attributes*.

Administrative Login Authentication

Fundamentally, TACACS+ provides the same services as RADIUS. Every authentication login attempt on an NAS is verified by a remote TACACS+ process.

TACACS+ authentication uses three packet types. Start packets and Continue packets are always sent by the user. Reply packets are always sent by the TACACS+ process.

TACACS+ sets up a TCP connection to the TACACS+ host and sends a Start packet. The TACACS+ host responds with a Reply packet, which either grants or denies access, reports an error, or challenges the user.

TACACS+ might challenge the user to provide username, password, passcode, or other information. Once the requested information is entered, TACACS+ sends a Continue packet over the existing connection. The TACACS+ host sends a Reply packet. Once the authentication is complete, the connection is closed. Only three login retries are allowed.

To enable login authentication through both TACACS+ and RADIUS servers, use the **aaa new-model** command to specify AAA authentication for Telnet sessions.

Privilege Authentication

The privilege authentication process determines whether a user is allowed to use commands at a particular privilege level. This authentication process is handled similarly to login authentication, except that the user is limited to one authentication attempt. An empty reply to the challenge forces an immediate access denial. The **aaa authentication enable default** command allows you to set privilege authentication for users.

Login Authorization

To allow login authorization through the TACACS+ server, you can use the following commands: **aaa authorization**, **aaa authorization config-commands**, and **authorization**. For information about using these commands, see *JUNOSe System Basics Configuration Guide, Chapter 9, Passwords and Security*.

Accounting

The TACACS+ accounting service enables you to create an audit trail of User Exec sessions and command-line interface (CLI) commands that have been executed within these sessions. For example, you can track user CLI connects and disconnects, when configuration modes have been entered and exited, and which configuration and operational commands have been executed.

You configure TACACS+ accounting in the JUNOSe software by defining accounting method lists and then associating consoles and lines with the method lists. You define an accounting method list with a service type, name, accounting mode, and method:

- service type—Specifies the type of information being recorded
- name—Uniquely identifies an accounting method list within a service type
- accounting mode—Specifies what type of accounting records will be generated
- method—Specifies the protocol for sending the accounting records to a security server

You can then configure consoles and lines with an accounting method list name for each service type:

- Method list—A specified configuration that defines how the NAS performs the AAA accounting service. A service type can be configured with multiple method lists with different names, and a method list name can be used for different service types. Initially, no accounting method list is defined; therefore TACACS+ accounting is disabled.
  - Default method list—Configuration used by consoles and lines when no named method list is assigned. You enable TACACS+ accounting by defining default accounting method lists for each service type.
  - Named method list—Assigned to a console, specific line, or group of lines; overrides the default method list.
- Service type—Specifies the type of information provided by the TACACS+ accounting service:
  - Exec—Provides information about User Exec terminal sessions, such as telnet, Local Area Transport (LAT), and rlogin, on the NAS.
  - Commands <0-15>—Provides information about User Exec mode CLI commands for a specified privilege level that are being executed on the NAS. Each of the sixteen command privilege levels is a separate service type. Accounting records are generated for commands executed by users, CLI scripts, and macros.
- Accounting mode—Specifies the type of accounting records that are recorded on the TACACS+ server. Accounting records track user actions and resource usage. You can analyze and use the records for network management, billing, and auditing purposes.
  - start-stop—A start accounting record is generated just before a process begins, and a stop accounting record is generated after a process successfully completes. This mode is supported only for the Exec service type.
  - stop-only—A stop accounting record is generated after a process successfully completes. This mode is supported only for the Commands service types.

The NAS sends TACACS+ accounting packets to the TACACS+ host. The accounting packets contain data in the packet header, packet body, and attribute-value pairs (AVPs). Table 62 provides descriptions of the TACACS+ accounting data.

Table 62: TACACS+ Accounting Information

Field/Attribute	Location	Description
major_version	Packet header	Major TACACS+ version number
minor_version	Packet header	Minor TACACS+ version number
type	Packet header	Type of the AAA service: Accounting
flags	Packet body	Bitmapped flags representing the record type: start accounting record or stop accounting record
priv-level	Packet body	Privilege level of the user executing the Exec session or CLI command: 0 - 15
user	Packet body	Name of user running the Exec session or CLI command
port	Packet body	NAS port used by the Exec session or CLI command
rem-addr	Packet body	User's remote location; either an IP address or the caller ID
service	AVP	User's primary service: Shell
cmd	AVP	CLI command that is to be executed: specified for Command-level accounting only
task_id	AVP	Unique sequential identifier used to match start and stop records for a task
elapsed_time	AVP	Elapsed time in seconds for the task execution: specified for Exec-level accounting stop records only
timezone	AVP	Time zone abbreviation used for all timestamps

Platform Considerations

TACACS+ is supported on all E-series routers. For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For additional information about the TACACS+ protocol, see the following resources:

- The TACACS+ Protocol, Version 1.78—draft-grant-tacacs-02.txt (January 1997 expiration)
- RFC 2865—Remote Authentication Dial In User Service (RADIUS) (June 2000)

NOTE: IETF drafts are valid for only 6 months from the date of issuance. They must be considered as works in progress. Please refer to the IETF Web site at http://www.ietf.org for the latest drafts.

Before You Configure TACACS+

Before you begin to configure TACACS+, you must determine the following for the TACACS+ authentication and accounting servers:

- IP addresses
- TCP port numbers
- Secret keys

Configuring TACACS+ Support

To use TACACS+, you must enable AAA. To configure your router to support TACACS+, perform the following tasks. Some of the tasks are optional. Once you configure TACACS+ support on the router, you can configure TACACS+ authentication, authorization, and accounting independent of each other.

1. Specify the names of the IP host or hosts maintaining a TACACS+ server. Optionally, you can specify other parameters, such as port number, timeout interval, and key.

   host1(config)#**tacacs-server host 192.168.1.27 port 10 timeout 3 key your_secret primary**

2. (Optional) Set the authentication and encryption key value shared by all TACACS+ servers that do not have a server-specific key set up by the **tacacs-server host** command.

   host1(config)#**tacacs-server key “&#889P^”**

3. (Optional) Set alternative source address(es) to be used for TACACS+ server communications.

   host1(config)#**tacacs-server source-address 192.168.134.63**

4. (Optional) Set the timeout value for all TACACS+ servers that do not have a server-specific timeout set up by the **tacacs-server host** command.

   host1(config)#**tacacs-server timeout 15**

Configuring Authentication

Once TACACS+ support is enabled on the router, you can configure TACACS+ authentication. Perform the following steps:

1. Specify AAA new model as the authentication method for the vty lines on your router.

   host1(config)#**aaa new-model**

2. Specify AAA authentication by defining an authorization methods list.

   host1(config)#**aaa authentication login tac tacacs+ radius enable**

3. Specify the privilege level by defining a methods list that uses TACACS+ for authentication.

   host1(config)#**aaa authentication enable default tacacs+ radius enable**

4. Configure vty lines.

   host1(config)#**line vty 0 4**

5. Apply an authentication list to the vty lines you specified on your router.

   host1(config-line)#**login authentication tac**

Configuring Accounting

Once TACACS+ support is enabled on the router, you can configure TACACS+ accounting. Perform the following steps:

1. Specify AAA new model as the accounting method for your router.

   host1(config)#**aaa new-model**

2. Enable TACACS+ accounting on the router, and configure accounting method lists. For example:

   host1(config)#**aaa accounting exec default start-stop tacacs+**
   host1(config)#**aaa accounting commands 0 listX stop-only tacacs+**
   host1(config)#**aaa accounting commands 1 listX stop-only tacacs+**
   host1(config)#**aaa accounting commands 13 listY stop-only tacacs+**
   host1(config)#**aaa accounting commands 14 default stop-only tacacs+**
   host1(config)#**aaa accounting commands 15 default stop-only tacacs+**

3. (Optional) Specify that accounting records are not generated for users without explicit user names.

   host1(config)#**aaa accounting suppress null-username**

4. Apply accounting method lists to a console or lines. For example:

   host1(config)#**line console 0**
   host1(config-line)#**accounting commands 0 listX**
   host1(config-line)#**accounting commands 1 listX**
   host1(config-line)#**accounting commands 13 listY**
   host1(config-line)#**exit**
   host1(config)#**line vty 0 4**
   host1(config-line)#**accounting commands 13 listY**

Note that Exec accounting and User Exec mode commands accounting for privilege levels 14 and 15 are now enabled for all lines and consoles with the creation of their default method list, as shown in Step 2.

aaa accounting commands

- Use to enable TACACS+ accounting and capture accounting information for a specific JUNOSe privilege level on the router and to create accounting method lists.
- Specify the JUNOSe privilege level (0 through 15) for which to capture accounting information.
- Specify **default** to configure the default method list, or configure a named method list. The default method list is used by lines and consoles unless a named method list is configured for them.
- Specify **stop-only** to send a stop accounting notice at the end of a process and **tacacs+** as the accounting protocol.
- Example

  host1(config)#**aaa accounting commands 12 listX stop-only tacacs+**

- Use the **no** version to delete the accounting method list.

aaa accounting exec

- Use to enable TACACS+ accounting and capture accounting information for User Exec terminal session on the router and to create accounting method lists.
- Specify **default** to configure the default method list, or configure a named method list. The default method list is used by lines and consoles unless a named method list is configured for them.
- Specify **start-stop** to send a start accounting notice at the beginning of a process and a stop accounting notice at the end of a successful process. Specify **tacacs+** as the accounting protocol.
- Example

  host1(config)#**aaa accounting exec default start-stop tacacs+**

- Use the **no** version to delete the accounting method list.

aaa accounting suppress null-username

- Use to prevent JUNOSe software from generating accounting records for users who do not have explicit usernames.
- Example

  host1(config)#**aaa accounting suppress null-username**

- Use the **no** version to generate accounting records for users with null usernames.

aaa authentication enable default

- Use to allow privilege determination to be authenticated through the TACACS+ server. This command specifies a list of authentication methods that are used to determine whether a user is granted access to the privilege command level.
- The authentication methods that you can use in a list include these options: **radius**, **line**, **tacacs+**, **none**, and **enable**.
- To specify that the authentication should succeed even if all methods return an error, specify **none** as the final method in the command line.
- Requests sent to a TACACS+ server include the username that is entered for login authentication.
- If a default authentication routine is not set for a function, the default is **none**, and no authentication is performed.
- If the authentication method list is empty, the local **enable** password is used.
- Example

  host1(config)#**aaa authentication enable default tacacs+ radius**

- Use the **no** version to empty the list.

aaa authentication login

- Use to set AAA authentication at login. This command creates a list that specifies the methods of authentication.
- Once you specify **aaa new-model** as the authentication method for vty lines, an authentication list called "default" is automatically assigned to the vty lines. To allow users to access the vty lines, you must create an authentication list and either:
  - Name the list "default."
  - Assign a different name to the authentication list, and assign the new list to the vty line using the **login authentication** command.
- The authentication methods that you can use in a list include these options: **radius**, **line**, **tacacs+**, **none**, and **enable**.
- The router traverses the list of authentication methods to determine whether a user is allowed to start a Telnet session. If a specific method is available but the user information is not valid (such as an incorrect password), the router does not continue to traverse the list and denies the user a session.

- If a specific method is unavailable, the router continues to traverse the list. For example, if **tactacs+** is the first authentication type element on the list and the TACACS+ server is unreachable, the router attempts to authenticate with the next authentication type on the list, such as **radius**.
- The router assumes an implicit denial of service if it reaches the end of the authentication list without finding an available method.
- Example

  host1(config)#**aaa authentication login my_auth_list tacacs+ radius line none**

- Use the **no** version to remove the authentication list from your configuration.

aaa new-model

- Use to specify AAA new model as the authentication method for the vty lines on your router.
- If you specify AAA new model and you do not create an authentication list, users will not be able to access the router through a vty line.
- Example

  host1(config)#**aaa new-model**

- Use the **no** version to restore simple authentication (login and password).

accounting

- Use to specify accounting method lists used on a console or vty line. Consoles and lines are initially configured with the default method list for all accounting service types (for example, Exec, Commands).
- Specify **exec** to capture accounting information for User Exec terminal sessions or **commands** to capture accounting information for User Exec mode commands at the indicated JUNOSe privilege level (0 through 15).
- Specify the name of the method list to be applied to the line or console.
- To disable accounting for a line or console, specify a nonexisting accounting method list name (for example, noAccounting).
- Example

  host1(config)#**accounting commands 12 listY**

- Use the **no** version to restore the default method list.

line

- Use to open or configure console or vty lines.
- You can specify a single line or a range of lines. The range is 0 though 29 for vty lines, 0 for the console line.
- Example

  host1(config)#**line vty 6 10**
  host1(config-line)#

- Use the **no** version to remove a line or a range of lines from the configuration. Lines that you remove will no longer be available for use by telnet, FTP, or SSH. When you remove a vty line, the router removes all lines above that line. For example, **no line vty 6** causes the router to remove lines 6 through 19. You cannot remove lines 0 through 4.

login authentication

- Use to apply an authentication list to the vty lines you specified on your router.
- Example

  host1(config-line)#**login authentication my_auth_list**

- Use the **no** version to specify that the router should use the default authentication list.

tacacs-server host

- Use to add or delete a host to or from the list of TACACS+ servers.
- You can optionally specify a nondefault port number, a host-specific key, a single connection and a timeout interval.
- Use the **primary** keyword to assign the host as the primary host.
- If a timeout value is specified, it overrides the global timeout value set with the **tacacs-server timeout** command for this server only.
- You can configure additional hosts by using this command. The designated primary host is always the first in the search order; the remaining hosts are contacted in the order in which they were created. If the primary host is deleted, or if you modify the primary host without specifying the **primary** keyword, the next host in the search order becomes the primary host. The search order is maintained when the NAS is reloaded.
- Example

  host1(config)#**tacacs-server host 192.168.1.27 port 10 timeout 3 key your_secret primary**
  host1(config)#**no tacacs-server host 192.168.1.27**

- Use the **no** version to delete the host from the list of TACACS+ servers.

tacacs-server key

- Use to set or reset the authentication encryption key value shared by all TACACS+ servers that do not have a server-specific key set up by the **tacacs-server host** command.
- This key must match the key configured on the TACACS+ process.
- Leading spaces are ignored; however, spaces at the end of the key are recognized. If you use spaces in the key, do not enclose the key in quotation marks.
- Example

  host1(config)#**tacacs-server key &# 889khj**

- Use the **no** version to reset a key value shared by all TACACS+ servers.

tacacs-server source-address

- Use to set or reset an alternative source address to be used for TACACS+ server communications.
- Existing connections are not affected by this command.
- Example

  host1(config)#**tacacs-server source-address 192.168.134.63**

- Use the **no** version to remove the address.

tacacs-server timeout

- Use to set the interval in seconds that the server waits for the server host to reply. The specified interval is shared by all TACACS+ servers that do not have a server-specific timeout set up by **tacacs-server host** command.
- The timeout interval is between 1 and 300. The default is 5 seconds.
- Example

  host1(config)#**tacacs-server timeout 15**

- Use the **no** version to reset the timeout to the default.

Chapter 10
Monitoring TACACS+

This chapter describes how to monitor the current TACACS + configurations.

TACACS + topics are described in the following sections:

Setting Baseline TACACS+ Statistics

You can set a baseline for TACACS + statistics.

To set the baseline:

- Issue the **baseline tacacs** command:

  host1#**baseline tacacs**

There is no **no** version.

Related Topics

- **baseline tacacs** command

Monitoring TACACS+ Statistics

Purpose Display TACACS + statistics.

Action To display TACACS + statistics:

```
host1#show statistics tacacs
          TACACSPLUS Statistics
          ---------------------
   Statistic      10.5.0.174   10.5.1.199
---------------   ----------   ----------
Search Order      1            2
TCP Port          3049         4049
Auth Requests     140          0
Auth Replies      85           0
```

```
Auth Pending      43          0
Auth Timeouts     12          0
Author Requests   6399        97
Author Replies    6301        0
Author Pending    0           0
Author Timeouts   98          97
Acct Requests     6321        37
Acct Replies      6280        0
Acct Pending      4           0
Acct Timeouts     37          37
```

Meaning Table 63 lists the **show statistics tacacs** command output fields.

Table 63: show statistics tacacs Output Fields

Field Name	Field Description
Statistic	IP address of the host
Search Order	The order in which requests are sent to hosts until a response is received
TCP Port	TCP port of the host
Auth Requests	Number of authentication requests sent to the host
Auth Replies	Number of authentication replies received from the host
Auth Pending	Number of expected but not received authentication replies from the host
Auth Timeouts	Number of authentication timeouts for the host
Author Requests	Number of authorization requests sent to the host
Author Replies	Number of authorization replies received from the host
Author Pending	Number of expected but not received authorization replies from the host
Author Timeouts	Number of authorization timeouts for the host
Acct Requests	Number of accounting requests sent to the host
Acct Replies	Number of accounting replies received from the host
Acct Pending	Number of expected but not received accounting replies from the host
Acct Timeouts	Number of accounting timeouts for the host

Related Topics

- **show statistics tacacs** command

Monitoring TACACS+ Information

Purpose Display TACACS + information.

Action To display TACACS + information.

```
host1#show tacacs
Key = hippo
Timeout = <NOTSET>, built-in timeout of 5 will be used
Source-address = <NOTSET>

  TACACS+ Configuration, (*) denotes inherited
  --------------------------------------------
             Tcp                                      Search
IP Address   Port   Timeout   Primary      Key        Order
----------   ----   -------   -------   ---------   ------
10.5.0.174   3049   5 (*)     y         hippo (*)   1
10.5.1.199   1049   5 (*)     n         hippo (*)   2
```

To display overall statistics:

```
host1#show tacacs statistics
```

To display statistics since they were baselined; deltas are not calculated for the pending statistics:

```
host1#show tacacs delta
```

Meaning Table 64 lists the **show tacacs** command output fields.

Table 64: show tacacs Output Fields

Field Name	Field Description
Key	Authentication and encryption key
Timeout	TACACS + host response timeout in seconds
Source-address	Alternative source IP address configured
TACACSPLUS Configuration	Table contains statistics for each host
IP Address	IP address of the host
TCP Port	TCP port of the host for each IP address
Timeout	Timeout interval in seconds for each IP address
Primary	This IP address's primary host; options: `y` = yes, `n` = no
Key	Authentication and encryption key for this IP address
Search Order	The order in which requests are sent to hosts until a response is received

Related Topics

- **show tacacs** command

Part 3

Managing L2TP

Chapter 11

L2TP Overview

Layer 2 Tunneling Protocol (L2TP) is a client-server protocol that allows Point-to-Point Protocol (PPP) to be tunneled across a network. This chapter includes the following topics that provide information for configuring L2TP on the E-series router.

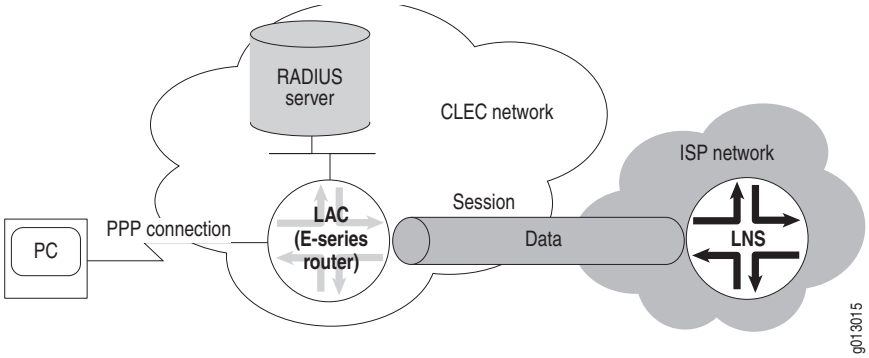
Overview

L2TP encapsulates layer 2 packets, such as PPP, for transmission across a network. An L2TP access concentrator (LAC), configured on an access device, such as an E-series router, receives packets from a remote client and forwards them to an L2TP network server (LNS), on a remote network.

You can configure your router to act as an LAC in pass-through mode in which the LAC receives packets from a remote client and then forwards them at layer 2 directly to the LNS.

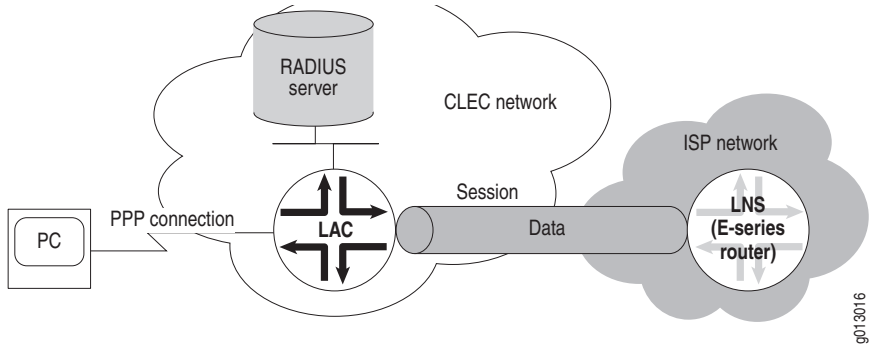
The E-series router creates tunnels dynamically by using authentication, authorization, and accounting (AAA) authentication parameters and transmits L2TP packets to the LNS via IP/User Datagram Protocol (UDP). Traffic travels in an L2TP *session*. A tunnel is an aggregation of one or more sessions. Figure 7 and Figure 8 show the E-series router in typical LAC and LNS arrangements.

Figure 7: Using the E-series Router as an LAC



.

Figure 8: Using the E-series Router as an LNS



NOTE: The E-series router does not support terminating both ends of a tunnel or session in the same router.

L2TP Terminology

Table 65 describes the basic terms for L2TP.

Table 65: L2TP Terms

Term	Description
Attribute value pair (AVP)	Combination of a unique attribute—represented by an integer—and a value containing the actual value identified by the attribute.
LAC	L2TP access concentrator (LAC)—a node that acts as one side of an L2TP tunnel endpoint and is a peer to the LNS. An LAC sits between an LNS and a remote system and forwards packets to and from each.
Call	A connection (or attempted connection) between a remote system and an LAC.
LNS	L2TP network server (LNS)—a node that acts as one side of an L2TP tunnel endpoint and is a peer to the LAC. An LNS is the logical termination point of a PPP connection that is being tunneled from the remote system by the LAC.

Table 65: L2TP Terms (continued)

Term	Description
Peer	In the L2TP context, refers to either the LAC or LNS. An LAC's peer is an LNS, and vice versa.
Proxy authentication	Authentication data from the PPP client that is sent from the LNS as part of a proxy LCP. Data might include attributes such as authentication type, authentication name, and authentication challenge.
Proxy LCP	LCP (Link Control Protocol) negotiation that is performed by the LAC on behalf of the LNS. Proxy sent by the LAC to the LNS containing attributes such as the last configuration attributes sent and received from the client.
Remote system	An end-system or router attached to a remote access network, which is either the initiator or recipient of a call.
Session	A logical connection created between the LAC and the LNS when an end-to-end PPP connection is established between a remote system and the LNS. **NOTE:** There is a one-to-one relationship between established L2TP sessions and their associated PPP connections.
Tunnel	A connection between an LAC-LNS pair consisting of a control connection and 0 or more L2TP sessions.

Implementing L2TP

The implementation of L2TP for the E-series router uses four levels:

- System—The router
- Destination—The remote L2TP system
- Tunnel—A direct path between the LAC and the LNS
- Session—A PPP connection in a tunnel

When the router has established destinations, tunnels, and sessions, you can control the L2TP traffic. Making a change to a destination affects all tunnels and sessions to that destination; making a change to a tunnel affects all sessions in that tunnel. For example, closing a destination closes all tunnels and sessions to that destination.

Sequence of Events on the LAC

The E-series router creates destinations, tunnels, and sessions dynamically, as follows:

1. The client initiates a PPP connection with the router.
2. The router and the client exchange Link Control Protocol (LCP) packets. For details about negotiating PPP connections, see *JUNOSe Link Layer Configuration Guide, Chapter 7, Configuring Point-to-Point Protocol*.
3. By using either a local database related to the domain name or RADIUS authentication, the router determines either to terminate or to tunnel the PPP connection.

4. If the router discovers that it should tunnel the session, it does the following:

   a. Sets up a new destination or selects an existing destination.

   b. Sets up a new tunnel or selects an existing tunnel.

   c. Opens a new session.

5. The router forwards the results of the LCP negotiations and authentication to the LNS.

A PPP connection now exists between the client and the LNS.

NOTE: The router discards received packets if the size of the variable-length, optional offset pad field in the L2TP header is too large. The router always supports packets that have an offset pad field of up to 16 bytes, and may support larger offset pad fields, depending on other information in the header. This restriction is a possible, although unlikely, cause of excessive discarding of L2TP packets.

Sequence of Events on the LNS

The E-series router sets up an LNS as follows:

1. An LAC initiates a tunnel with the router.

2. The router verifies that a tunnel with this LAC is valid—destination configured, hostname and tunnel password correct.

3. The router completes the tunnel setup with the LAC.

4. The LAC sets up a session with the router.

5. The router creates a dynamic PPP interface on top of the session.

6. If they are enabled and present, the router takes the proxy LCP and the proxy authentication data and passes them to PPP.

7. The E-series PPP processes the proxy LCP, if it is present, and, if acceptable, places LCP on the router in opened state without renegotiation of LCP.

NOTE: If proxy LCP is not present or not acceptable, the router negotiates LCP with the remote system.

8. The E-series PPP processes the proxy authentication data, if it is present, and passes the data to AAA for verification. (If the data is not present, E-series PPP requests the data from the remote system.)

9. The router passes the authentication results to the remote system.

Packet Fragmentation

The E-series router supports the reassembly of IP-fragmented L2TP packets. (For more information, see *JUNOSe IP Services Configuration Guide, Chapter 12, IP Reassembly for Tunnels*.) However, it is preferable to prevent fragmentation within L2TP tunnels because of the effects of fragmentation and reassembly on performance.

To prevent fragmentation, PPP LCP negotiation of the maximum receive unit (MRU) may be used to determine a proper maximum transmission unit (MTU). However, the normal automatic method of determining the proper MRU to negotiate (by evaluating the MRU of all lower layers in the interface stack) is not adequate for L2TP. The initial LCP negotiation between PPP in the client and the LAC is inadequate because it does not cover the entire extent of the eventual PPP session that travels all the way from the client to the LNS. Furthermore, even if PPP in the LNS chooses to renegotiate the MRU, it has no way to determine the proper MRU, since it does not know the minimum MRU on all of the intervening links between it and the LAC.

To overcome the inadequacy of normal determination of the MRU under such circumstances, you can configure the PPP MRU size by using the **ppp mru** command in Profile Configuration mode, Interface Configuration mode, or Subinterface Configuration mode. Use Profile Configuration mode for dynamic PPP interfaces, and Interface Configuration mode or Subinterface Configuration mode for static PPP interfaces.

When you specify the size, you need to take into account the MRU for all possible links between the LAC and the LNS. You must also take into account the L2TP encapsulation that is added to all packets entering the tunnel.

For example, if the link between the LAC and LNS with the lowest MRU were an Ethernet link, the following calculation applies:

Minimum link MRU	1500
L2TP encapsulating IP header	-20
L2TP encapsulating UDP header	-8
Maximum L2TP header (assumes a maximum of 16 bytes of Offset Pad)	-30
MRU size to specify	1442

If the smallest intervening link is an Ethernet link, specifying **ppp mru 1442** at either the LAC or LNS guarantees that no fragmentation will occur within the L2TP tunnel.

Platform Considerations

For information about modules that support LNS and LAC on the ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, ERX Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support LNS and LAC.

For information about modules that support LNS and LAC on the E120 router and the E320 router:

- See *E120 and E320 Module Guide, Table 1, Modules and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support LNS and LAC.

Module Requirements

The supported modules for LNS depends on the type of E-series router that you have.

ERX-7xx Models, ERX-14xx Models, and the ERX-310 Router

To use an LNS on ERX-7xx models, ERX-14xx models, and the ERX-310 router, at least one Service line module (SM) or a module that supports the use of shared tunnel-server ports must be installed in the ERX router. For information about installing modules in the ERX router, see the *ERX Hardware Guide*.

SMs provide dedicated tunnel-server ports that are always configured on the module. Unlike other line modules, SMs do not pair with corresponding I/O modules that contain ingress and egress ports. Instead, they receive data from and transmit data to other line modules with access to ingress and egress ports on their own associated I/O modules.

You can also create tunnels on E-series modules that support shared tunnel-server ports. You can configure (provision) a shared tunnel-server port to use a portion of the module's bandwidth to provide tunnel services. For a list of the modules that support shared tunnel-server ports, see the *ERX Module Guide*.

For information about configuring tunnel services on dedicated and shared tunnel-server ports, see *JUNOSe Physical Layer Configuration Guide, Chapter 6, Managing Tunnel-Service and IPSec-Service Interfaces*.

For information about line modules supported by the LAC and LNS and the type of support each module type receives, see *ERX Module Guide, Appendix A, Module Protocol Support*.

E120 Router and E320 Router

To use an LNS on an E120 router or an E320 router, you must install an ES2 4G line module (LM) with an ES2-S1 Service I/O adapter (IOA), or an IOA that supports the use of shared tunnel-server ports. For information about installing modules in these routers, see the *E120 and E320 Hardware Guide*.

The ES2 4G LM and ES2-S1 Service IOA combination provides a dedicated tunnel-server port that is always configured on the IOA. Unlike SMs, the ES2 4G LM requires the ES2-S1 Service IOA to condition it to receive and transmit data to other line modules. The ES2-S1 Service IOA also does not have ingress or egress ports.

You can also create tunnels on IOAs that support shared tunnel-server ports. You can configure (provision) a shared tunnel-server port to use a portion of the IOA's bandwidth to provide tunnel services. For a list of the IOAs that support shared tunnel-server ports, see the *E120 and E320 Module Guide*.

For information about IOAs supported by the LAC and LNS and the type of support each module type receives, see *E120 and E320 Module Guide, Appendix A, IOA Protocol Support*.

Sessions and Tunnels Supported

The E120 and E320 routers support 60,000 L2TP sessions, the ERX-1440 router supports 32,000 L2TP sessions, and all other E-series routers support a maximum of 16,000 L2TP sessions. The following guidelines apply:

- On all E-series routers

  The SM and the ES2-S1 Service IOA both support the termination of 16,000 LNS sessions per module. Therefore, if you want to apply input or output policies to all of the available LNS sessions, you can only terminate a maximum of 8000 sessions per module.

- On the E120 router, E320 router, and the ERX-1440 router

  You can create a systemwide maximum of 60,000 sessions per E120 or E320 router or 32,000 sessions per ERX-1440 router. The maximum session limit is spread in any combination across a maximum of 8000 tunnels. For a router that is operating as an LAC for some tunnels and as an LNS for others, the 8000 tunnels and the router's applicable maximum sessions limits apply to the combined total of LAC and LNS tunnels and sessions.

- On all E-series routers except the ERX-1440 router, E120 router, and the E320 router

You can create a systemwide maximum of 16,000 sessions spread in any combination across a maximum of 8000 tunnels shared between an LAC and an LNS. For a router that is operating as an LAC for some tunnels and as an LNS for others, the 8000 tunnels and 16,000 sessions limits apply to the combined total of LAC and LNS tunnels and sessions.

NOTE: In previous releases, the JUNOSe software required that you use the **license l2tp-session** command to configure a license to enable support for the maximum allowable L2TP sessions on ERX-1440 routers, E120 routers, and E320 routers. The **license l2tp-session** command still appears in the CLI, but it has no effect on the actual enforced limit. The reported license limit is 60,000. The **show license l2tp-session** command also still appears in the CLI.

- To obtain the maximum number of ingress and egress policy attachments supported for L2TP sessions, see *JUNOSe Release Notes, Appendix A, System Maximums*.

References

For more information about L2TP, see the following resources:

- RFC 2661—Layer Two Tunneling Protocol "L2TP" (August 1999)
- RFC 3145—L2TP Disconnect Cause Information (July 2001)
- Fail Over extensions for L2TP "failover"—draft-ietf-l2tpext-failover-06.txt (April 2006 expiration)

For information about L2TP high availability support, see *JUNOSe System Basics Configuration Guide, Chapter 7, Managing High Availability*.

For information about setting up policy-based routing features for L2TP, such as rate limit profiles, classifier control lists, and policy lists, see the *JUNOSe Policy Management Configuration Guide*.

For information about creating and attaching QoS profiles to L2TP sessions, see the *JUNOSe Quality of Service Configuration Guide*.

For information about how to secure Layer 2 Tunneling Protocol (L2TP) tunnels with IP Security (IPSec) on your E-series router, see *JUNOSe IP Services Configuration Guide, Chapter 13, Securing L2TP and IP Tunnels with IPSec*.

Chapter 12

Configuring an L2TP LAC

An L2TP access concentrator (LAC) receives packets from a remote client and forwards them to an L2TP network server (LNS), on a remote network. You can configure your E-series router to function as an LAC.

This chapter includes the following topics that provide information for configuring an L2TP LAC on the E-series router:

LAC Configuration Prerequisites

Before you begin configuring the router as a LAC, perform the following steps:

1. Create a virtual router.

   host1(config)#**virtual-router west**

2. Assign a router ID IP address, such as that for a loopback interface, to the virtual router. This address must be reachable by the L2TP peer.

   host1:west(config)#**ip router-id 10.10.45.3**

CAUTION: You must explicitly assign a router ID to a virtual router rather than using a dynamically assigned router ID. A fixed ID is required because every time the ID changes, L2TP must disconnect all existing tunnels and sessions that use the old ID. If you use a dynamically assigned router ID, the value can change without warning, leading to failure of all L2TP tunnels and sessions. Also, the router could dynamically assign a router ID that is not reachable by the L2TP peer, causing a complete failure of L2TP. You must set the router ID even if you specified a source address in the domain map or a local address in the host profile.

3. When configuring the router as a LAC, configure the router or virtual router for Broadband Remote Access Server (B-RAS).

NOTE: If you are using shared tunnel-server ports, you must configure the shared tunnel-server ports before you configure Layer 2 Tunneling Protocol (L2TP) network server (LNS) support. You use the **tunnel-server** command in Global Configuration mode to specify the physical location of the shared tunnel-server port that you want to configure.

See *JUNOSe Physical Layer Configuration Guide, Chapter 6, Managing Tunnel-Service and IPSec-Service Interfaces* for additional information about the **tunnel-server** command and shared tunnel-server ports.

Related Topics

- **virtual-router** command
- **ip router-id** command

Modifying L2TP LAC Default Settings for Managing Destinations, Tunnels, and Sessions

Configuring an E-series router for B-RAS enables the router to operate as an LAC with default settings. You can modify the default settings as follows:

- Enable the verification of data integrity via UDP.
- Specify the time period for which the router maintains dynamic destinations, tunnels, or sessions after termination.

NOTE: The previous two operations also apply to an LNS, however there is no default configuration that enables the LNS.

When the router is established as an LAC or LNS and is creating destinations, tunnels, and sessions, you can manage them as follows:

- Prevent the creation of new sessions, tunnels, and destinations.
- Close and reopen all or selected destinations, tunnels, and sessions.
- Configure drain timeout operations, which control the amount of time a disconnected LAC tunnel waits before restarting after receiving a restart request.
- Configure how many times the router retries a transmission if the initial attempt is unsuccessful.

NOTE: All the commands in this section apply to both the LAC and the LNS.

Related Topics

- Generating UDP Checksums in Packets to L2TP Peers on page 288
- Specifying a Destruct Timeout for L2TP Tunnels and Sessions on page 288
- Preventing Creation of New Destinations, Tunnels, and Sessions on page 289
- Shutting Down Destinations, Tunnels, and Sessions on page 290
- Specifying the Number of Retransmission Attempts on page 292

Generating UDP Checksums in Packets to L2TP Peers

You can configure the router to generate a UDP data integrity checksum in data packets sent to an L2TP peer. The router always uses UDP checksums during transmission and reception of L2TP control packets. Generation of checksums is disabled by default.

- To enable generation of UDP checksums:

  host1(config)#**l2tp checksum**

NOTE: This command does not affect the way the router checks the UDP data integrity checksum in L2TP data packets that are received from an L2TP peer. The router checks all non-zero received checksums and discards the packet if a data integrity problem is detected.

Related Topics

- **l2tp checksum** command

Specifying a Destruct Timeout for L2TP Tunnels and Sessions

You can specify the maximum time period, in the range 10–3600 seconds (1 hour), for which the router attempts to maintain dynamic destinations, tunnels, and sessions after they have been destroyed. The router uses a timeout of 600 seconds by default.

This command facilitates debugging and other analysis by saving underlying memory structures after the destination, tunnel, or session is terminated.

Any specific dynamic destination, tunnel, or session may not be maintained for this entire time period if the resources must be reclaimed early to allow new tunnels to be established.

TIP: If you use the **l2tp destination lockout timeout** command to configure an optional lockout timeout, always configure the destruct timeout to be longer than the lockout timeout. The destruct timeout overrides the lockout timeout—when the destruct timeout expires, all information about the locked out destination is deleted, including the lockout timeout and lockout test settings. See *Managing the L2TP Destination Lockout Process* on page 304.

- To specify a destruct timeout:

  host1(config)#**l2tp destruct-timeout 1200**

Related Topics

- **l2tp destruct-timeout** command

Preventing Creation of New Destinations, Tunnels, and Sessions

You can configure several L2TP drain operations, which determine how the router creates new L2TP destinations, tunnels, and sessions. You can manage the following features:

- Prevent creation of new destinations, tunnels, and sessions on the router
- Prevent creation of new tunnels and sessions at a specific destination
- Prevent creation of new sessions for a specific tunnel
- Specify how long a disconnected LAC L2TP tunnel waits before restarting after it receives a restart request

Preventing Creation of New Destinations, Tunnels, and Sessions on the Router

You use the **l2tp drain** command to prevent the creation of new destinations, tunnels, and sessions on the router.

The **l2tp drain** command and the **l2tp shutdown** command both affect the administrative state of L2TP on the router. Although each command has a different effect, the **no** version of each command is equivalent. Each command's **no** version leaves L2TP in the enabled state.

- To prevent the creation of new destinations, tunnels, and sessions:

  host1(config)#**l2tp drain**

Preventing Creation of New Tunnels and Sessions at a Destination

You use the **l2tp drain destination** command to prevent the creation of new tunnels and sessions at a specific destination.

The **l2tp drain destination** command and the **l2tp shutdown destination** command both affect the administrative state of L2TP for the destination. Although each command has a different effect, the **no** version of each command is equivalent. Each command's **no** version leaves L2TP in the enabled state.

- To prevent the creation of new tunnels and sessions at the specified destination:

  host1(config)#**l2tp drain destination ip 172.31.1.98**

Preventing Creation of New Sessions for a Tunnel

Use the **l2tp drain tunnel** command to prevent the creation of new sessions for a tunnel.

The **l2tp drain tunnel** command and the **l2tp shutdown tunnel** command both affect the administrative state of L2TP for the tunnel. Although each command has a different effect, the **no** version of each command is equivalent. Each command's **no** version leaves L2TP in the enabled state.

- To prevent the creation of new sessions for a specific tunnel:

  host1(config)#**l2tp drain tunnel virtual-router default ip 172.31.1.98 isp.com**

Preventing Creation of New Sessions for a Tunnel

Use the **l2tp tunnel short-drain-timeout** command to specify the amount of time a disconnected LAC L2TP tunnel waits before restarting after it receives a restart request.

You can specify a drain timeout in the range 0–31 seconds. This feature enables the router to restart tunnels more quickly than the standard 31-second drain time specified by RFC-2661. By default, the router uses a short-drain timeout of 2 seconds.

- To specify the short-drain timeout:

  host1(config)#**l2tp tunnel short-drain-timeout 12**

Related Topics

- **l2tp drain** command
- **l2tp drain destination** command
- **l2tp drain tunnel** command
- **l2tp tunnel short-drain-timeout** command

Shutting Down Destinations, Tunnels, and Sessions

You can configure how the router shuts down L2TP destinations, tunnels, and sessions. You can specify the following shut down methods, which also prevent the creation of new tunnels:

- Close all destinations, tunnels, and sessions on the router and prevent creation of new destinations, tunnels, and sessions
- Close all tunnels and sessions, and prevent creation of new tunnels and sessions, at a specific destination
- Close all sessions and prevent creation of new sessions for a specific tunnel
- Close a specific session

Closing Existing and Preventing New Destinations, Tunnels, and Sessions on the Router

You use the **l2tp shutdown** command to close all existing destinations, tunnels, and sessions, and to prevent the creation of new destinations, tunnels, and sessions on the router.

The **l2tp shutdown** command and the **l2tp drain** command both affect the administrative state of L2TP on the router. Although each command has a different effect, the **no** version of each command is equivalent. Each command's **no** version leaves L2TP in the enabled state.

- To close all destinations, tunnels, and sessions on the router:

  host1(config)#**l2tp shutdown**

Closing Existing and Preventing New Tunnels and Sessions for a Destination

You use the **l2tp shutdown destination** command to close all existing tunnels and sessions for a destination and to prevent the creation of tunnels and sessions for that destination.

The **l2tp shutdown destination** command and the **l2tp drain destination** command both affect the administrative state of L2TP for the destination. Although each command has a different effect, the **no** version of each command is equivalent. Each command's **no** version leaves L2TP in the enabled state.

- To close tunnels and sessions, and prevent creation of new tunnels and sessions for the specified destination:

  host1(config)#**l2tp shutdown destination 1**

Closing Existing and Preventing New Sessions in a Specific Tunnel

You use the **l2tp shutdown tunnel** command to close all sessions in a tunnel and to prevent the creation of sessions in a tunnel.

The **l2tp shutdown tunnel** command and the **l2tp drain tunnel** command both affect the administrative state of L2TP for the tunnel. Although each command has a different effect, the **no** version of each command is equivalent. Each command's **no** version leaves L2TP in the enabled state.

- To close all existing sessions in a specific tunnel and prevent creation of new sessions:

  host1(config)#**l2tp shutdown tunnel 1/isp.com**

Closing a Specific Session

You use the **l2tp shutdown session** command to close the specified session.

- To close a specific session:

  host1(config)#**l2tp shutdown session 1/1/1**

Related Topics

- **l2tp shutdown** command
- **l2tp shutdown destination** command
- **l2tp shutdown session** command
- **l2tp shutdown tunnel** command

Specifying the Number of Retransmission Attempts

You can specify the number of retransmission attempts the router uses for tunnels, in the range 2–7. By default, the router uses a retry count of 5.

Use the **established** keyword to apply the retry count only to established tunnels. Use the **not-established** keyword to apply the retry count only to tunnels that are not established. If you do not include a keyword, the router applies the retry count to both established and nonestablished tunnels.

- To configure the number of retransmission attempts:

  host1(config)#**l2tp retransmission 4 established**

Related Topics

- **l2tp retransmission** command

Configuring Calling Number AVP Formats

The E-series LAC generates L2TP Calling Number AVP 22 for incoming-call request (ICRQ) packets that the LAC sends to the LNS. By default, the E-series LAC generates the Calling Number AVP 22 in descriptive format.

You can also prevent the E-series LAC from sending the Calling Number AVP in ICRQ packets.

NOTE: You cannot change the L2TP Calling Number AVP on tunnel switched interfaces.

You use the **aaa tunnel calling-number-format** command to configure the router to generate AVP 22 in any of the following formats. Agent-circuit-id is suboption 1 of the tags supplied by the PPPoE intermediate agent from the DSLAM. Agent-remote-id is suboption 2.

- Descriptive format—This is the default format, and includes the following elements:

  < interface ID > < delimit > < UID > < delimit > < interface description > < delimit > < connect info > < delimit > < PPPoE description >

- Descriptive include-agent-circuit-id format—This format includes the following elements:

  < interface ID > < delimit > < UID > < delimit > < interface description > < delimit > < connect info > < delimit > < PPPoE description > < delimit > < agent-circuit-id >

- Descriptive include-agent-circuit-id include-agent-remote-id format—This format includes the following elements:

  < interface ID > < delimit > < UID > < delimit > < interface description > < delimit > < connect info > < delimit > < PPPoE description > < delimit > < agent-circuit-id > < delimit > < agent-remote-id >

- Descriptive include-agent-remote-id format—This format includes the following elements:

  < interface ID > < delimit > < UID > < delimit > < interface description > < delimit > < connect info > < delimit > < PPPoE description > < delimit > < agent-remote-id >

- Fixed format—This format is similar to the fixed format of RADIUS attribute 31 (Calling-Station-Id). If you set up the router to generate the Calling Number AVP in fixed format, the router formats the AVP as follows (the maximum number of characters for each field is shown in brackets):

  - For ATM: < system name [4] > < slot [2] > < port [1] > < VPI [3] > < VCI [5] >

  - For Ethernet: < system name [4] > < slot [2] > < port [1] > < VLAN [8] >

  - Example

    system name = westford, slot = 4, port = 3, and VLAN = 12 produces the following calling number:

    west0430000000012

- Include-agent-circuit-id format—This format includes the following element:

  < agent-circuit-id >

- Include-agent-circuit-id include-agent-remote-id format—This format includes the following elements:

  < agent-circuit-id > < delimit > < agent-remote-id >

- Include-agent-remote-id format—This format includes the following element:

  < agent-remote-id >

Configuration Tasks

To set up the router to generate Calling Number AVP 22 in fixed format:

1. Set the calling number format of the tunnel to **fixed**.

   host1(config)#**aaa tunnel calling-number-format fixed**

2. Set the format of the RADIUS Calling-Station-Id to **fixed**.

   host1(config)#**radius calling-station-format fixed-format**

Configuring the Fallback Format

You can configure a fallback AVP 22 format—the E-series LAC uses the fallback format to generate the L2TP Calling Number AVP 22 in the event that the PPPoE agent ID is null or unavailable. The LAC uses the fallback format only when the configured calling number format includes either or both of the agent-circuit-id and agent-remote-id suboptions. You can specify either descriptive format or fixed format.

The calling number format determines what element triggers use of the fallback format, as shown in the following table:

Calling Number Format	Fallback Trigger
agent-circuit-id	agent-circuit-id is empty
agent-circuit-id include-agent-remote-id	Both agent-circuit-id and agent-remote-id are empty.
agent-remote-id	agent-remote-id is empty
descriptive include-agent-circuit-id	agent-circuit-id is empty
descriptive include-agent-circuit-id include-agent-remote-id	Both agent-circuit-id and agent-remote-id are empty.
descriptive include-agent-remote-id	agent-remote-id is empty

- To configure the fallback AVP format:

  host1(config)#**aaa tunnel calling-number-format-fallback fixed**

Disabling the Calling Number AVP

You can use the **l2tp disable calling-number-avp** command to prevent the E-series LAC from sending the Calling Number AVP in ICRQ packets. You use this command in special situations where you do not want the LAC to send this AVP.

- To prevent the LAC from sending the Calling Number AVP:

  host1(config)#**l2tp disable calling-number-avp**

For more information about setting up the router to generate Calling Number AVP 22 in a format that includes either or both of the agent-circuit-id and agent-remote-id suboptions of the tags supplied by the PPPoE intermediate agent, see *Configuring PPPoE Remote Circuit ID Capture* in *JUNOSe Link Layer Configuration Guide, Chapter 10, Configuring Point-to-Point Protocol over Ethernet*.

Configuration Examples

The following examples show how you can synchronize the contents of RADIUS Calling-Station-Id (Attribute 31) and L2TP Calling-Number (AVP 22).

To send the PPPoE agent-circuit-id in RADIUS Attribute 31 and L2TP AVP 22 and specify that the fixed format is used when the PPPoE agent-circuit-id is unavailable, issue the following commands:

host1(config)#**radius calling-station-format fixed-format**
host1(config)#**radius remote-circuit-id-delimiter #**
host1(config)#**radius override calling-station-id remote-circuit-id**
host1(config)#**radius remote-circuit-id-format agent-circuit-id**

host1(config)#**aaa tunnel calling-number-format include-agent-circuit-id**
host1(config)#**aaa tunnel calling-number-format-fallback fixed**

To send the PPPoE agent-circuit-id and agent-remote-id in RADIUS Attribute 31 and L2TP AVP 22 and specify that the fixed format is used when both PPPoE agent-circuit-id and agent-remote-id are unavailable, issue the following commands:

host1(config)#**radius calling-station-format fixed-format**
host1(config)#**radius remote-circuit-id-delimiter #**
host1(config)#**radius override calling-station-id remote-circuit-id**
host1(config)#**radius remote-circuit-id-format agent-circuit-id agent-remote-id**

host1(config)#**aaa tunnel calling-number-format include-agent-circuit-id include-agent-remote-id**
host1(config)#**aaa tunnel calling-number-format-fallback fixed**

Related Topics

- **aaa tunnel calling-number-format** command
- **aaa tunnel calling-number-format-fallback** command
- **l2tp disable calling-number-avp** command
- **radius calling-station-format** command

Mapping a User Domain Name to an L2TP Tunnel Overview

The router uses either the local database related to the domain name or a RADIUS server to determine whether to terminate or tunnel PPP connections.

For information about setting up RADIUS to provide this mapping, see *Chapter 1, Configuring Remote Access*.

For a given domain map, you can choose one of two methods to map the domain to an L2TP tunnel locally on the router:

- Configure tunnels for a domain map and then define tunnel attributes from Domain Map Tunnel configuration mode.
- Configure a tunnel group and then define the attributes for its tunnels from Tunnel Group Tunnel Configuration mode. Use this method only when no tunnels are currently defined for the domain map from Domain Map Tunnel configuration mode. By default, tunnel groups are not assigned to the domain map.

  After configuring a tunnel group and the attributes for its tunnels, you can assign the tunnel group to the domain map from Domain Map mode. The tunnel group reference in the domain map is used instead of tunnel definitions configured from Domain Map Tunnel configuration mode.

  The RADIUS server can reference tunnel groups through the RADIUS Tunnel Group [26-64] attribute. The advantages of RADIUS support for tunnel groups are:

  - The RADIUS server can maintain a single tunnel group attribute associated with each user instead of sets of tunnel attributes for each user.
  - The RADIUS server can authenticate users before attempting to establish tunnels.

Related Topics

- Mapping User Domain Names to L2TP Tunnels from Domain Map Tunnel Mode on page 296
- Mapping User Domain Names to L2TP Tunnels from Tunnel Group Tunnel Mode on page 300

Mapping User Domain Names to L2TP Tunnels from Domain Map Tunnel Mode

To map a domain to an L2TP tunnel locally on the router from Domain Map Tunnel mode, perform the following steps:

1. Specify a domain name and enter Domain Map Configuration mode:

   ```
   host1(config)#aaa domain-map westford.com
   host1(config-domain-map)#
   ```

2. Specify a virtual router; in this case, the *default* router is specified.

   ```
   host1(config-domain-map)#router-name default
   ```

3. Specify a tunnel to configure and enter Domain Map Tunnel Configuration mode:

   ```
   host1(config-domain-map)#tunnel 3
   ```

4. Specify the LNS endpoint address of a tunnel.

   host1(config-domain-map-tunnel)#**address 192.0.2.13**

5. (Optional) Assign a tunnel group to the domain map. You can assign a tunnel group only when no tunnels are currently defined for the domain map from AAA Domain Map Tunnel mode.

   host1(config-domain-map)#**tunnel group storm**

6. Specify a preference for the tunnel.

   You can specify up to eight levels of preference, and you can assign the same preference to a maximum of 31 tunnels. When you define multiple preferences for a destination, you increase the probability of a successful connection.

   host1(config-domain-map-tunnel)#**preference 5**

7. (Optional) Specify an authentication password for the tunnel.

   host1(config-domain-map-tunnel)#**password temporary**

NOTE: If you specify a password for the LAC, the router requires that the peer (the LNS) authenticate itself to the router. In this case, if the peer fails to authenticate itself, the tunnel terminates.

8. (Optional) Specify a hostname for the LAC end of the tunnel.

   The LAC sends the hostname to the LNS when communicating to the LNS about the tunnel. The hostname can be up to 64 characters (no spaces).

   host1(config-domain-map-tunnel)#**client-name host4**

NOTE: If the LNS does not accept tunnels from unknown hosts, and if no hostname is specified, the LAC uses the router name as the hostname.

9. (Optional) Specify a server name for the LNS.

   This name specifies the hostname expected from the peer (the LNS) when you set up a tunnel. When this name is specified, the peer must identify itself with this name during tunnel startup. Otherwise, the tunnel is terminated. The server name can be up to 64 characters (no spaces).

   host1(config-domain-map-tunnel)#**server-name boston**

10. (Optional) Specify a source IP address for the LAC tunnel endpoint. All L2TP packets sent to the peer use this source address.

    host1(config-domain-map-tunnel)#**source-address 192.0.3.3**

By default, the router uses the virtual router's router ID as the source address. You can override this behavior for an L2TP tunnel by specifying a source address. If you do specify a source address, use the address of a stable IP interface (for example, a loopback interface). Make sure that the address is configured in the virtual router for this domain map, and that the address is reachable by the peer.

11. Specify a tunnel identification. (The router groups L2TP sessions with the same tunnel identification into the same tunnel.)

    host1(config-domain-map-tunnel)#**identification acton**

    The router groups L2TP sessions with the same tunnel identification into the same tunnel. This occurs only when both the destination (virtual router, IP address) and the ID are the same.

12. Specify the L2TP tunnel type (RADIUS attribute 64, Tunnel-Type). Currently, the only supported value is L2TP.

    host1(config-domain-map-tunnel)#**type l2tp**

13. Specify a medium type for the tunnel. (L2TP supports only IP version 4 [IPv4].)

    host1(config-domain-map-tunnel)#**medium ipv4**

14. (Optional) Specify a default tunnel client name.

    host1(config-domain-map-tunnel)#**exit**
    host1(config-domain-map)#**exit**
    host1(config)#**aaa tunnel client-name boxford**

    If the tunnel client name is not included in the tunnel attributes that are returned from the domain map or authentication server, the router uses the default name.

15. (Optional) Specify a default tunnel password.

    host1(config)#**aaa tunnel password 3&92k%b#q4**
    host1(config)#**exit**

    If the tunnel password is not included in the tunnel attributes that are returned from the domain map or authentication server, the router uses the default password.

16. (Optional) Set the format for the tunnel assignment ID that is passed to PPP/L2TP.

    The tunnel assignment ID format can be either only assignmentID or clientAuthId + serverAuthId + assignmentId.

    host1(config)#**aaa tunnel assignment-id-format assignmentID**

    If you do not set a tunnel assignment ID, the software sets it to the default (assignmentID). This parameter is only generated and used by the L2TP LAC device.

17. (Optional) Specify whether or not to use the tunnel peer's Nas-Port [5] and Nas-Port-Type [61] attributes.

    When enabled, the attribute is supplied by the tunnel peer. When disabled, the attribute is not supplied. Use the **no** version of the command to restore the default, enable.

    ```
    host1(config)#aaa tunnel ignore nas-port enable
    host1(config)#aaa tunnel ignore nas-port-type disable
    ```

18. (Optional) Set up the router to ignore sequence numbers in data packets received on L2TP tunnels.

    ```
    host1(config)#l2tp ignore-receive-data-sequencing
    ```

    This command does not affect the insertion of sequence numbers in packets *sent* from the router.

BEST PRACTICE: We recommend that you set up the router to ignore sequence numbers in received data packets if you are using IP reassembly. Because IP reassembly might reorder L2TP packets, out-of-order packets might be dropped when sequence numbers are being used on L2TP data packets.

19. (Optional) Disable the generation of authentication challenges by the local tunnel, so that the tunnel does not send a challenge during negotiation. However, the tunnel does accept and respond to challenges it receives from the peer.

    ```
    host1(config)#l2tp disable challenge
    ```

20. Verify the L2TP tunnel configuration.

```
host1(config)#show aaa domain-map

Domain: westford.com; router-name: default; ipv6-router-name: default
                                                                    Tunnel
Tunnel   Tunnel         Tunnel        Tunnel   Tunnel    Tunnel    Tunnel   Client
 Tag      Peer          Source         Type    Medium   Password     Id      Name
------   ------------   -----------   ------   ------   ---------  ------   ------
3        192.168.2.13   192.168.3.3   l2tp     ipv4     temporary  acton    host4

         Tunnel                Tunnel                      Tunnel
Tunnel   Server     Tunnel       Max                       Virtual
 Tag      Name    Preference   Sessions     Tunnel RWS     Router
------   ------   ----------   --------   --------------   -------
3        boston   5            0          system chooses   vr2
```

```
host1#show aaa tunnel-parameters
Tunnel password is 3&92k%b#q4
Tunnel client-name is <NULL>
Tunnel nas-port-method is none
Tunnel nas-port ignore disabled
Tunnel nas-port-type ignore disabled
Tunnel assignmentId format is assignmentId
Tunnel calling number format is descriptive
```

Related Topics

- Mapping User Domain Names to L2TP Tunnels from Tunnel Group Tunnel Mode on page 300
- **aaa domain-map** command
- **aaa tunnel assignment-id-format** command
- **aaa tunnel client-name** command
- **aaa tunnel ignore** command
- **aaa tunnel password** command
- **address** command
- **client-name** command
- **identification** command
- **l2tp disable challenge** command
- **l2tp ignore-receive-data-sequencing** command
- **medium ipv4** command
- **password** command
- **preference** command
- **router-name** command
- **server-name** command
- **source-address** command
- **tunnel** command
- **tunnel group** command
- **type** command

Mapping User Domain Names to L2TP Tunnels from Tunnel Group Tunnel Mode

To map a domain to an L2TP tunnel locally on the router from Tunnel Group Tunnel Configuration mode, perform the following steps:

1. Specify an AAA tunnel group and change the mode to Tunnel Group Tunnel Configuration mode. From Tunnel Group Tunnel Configuration mode, you can add up to 31 tunnel definitions.

   ```
   host1(config)#aaa tunnel-group westford
   host1(config-tunnel-group)#
   ```

2. Specify a tunnel to configure and enter Tunnel Group Tunnel Configuration mode:

   host1(config-tunnel-group)#**tunnel 3**
   host1(config-tunnel-group-tunnel)#

3. Specify a virtual router; in this case, the *default* router is specified.

   host1(config-tunnel-group-tunnel)#**router-name default**

4. Specify the LNS endpoint address of a tunnel.

   host1(config-tunnel-group-tunnel)#**address 192.0.2.13**

5. Specify a preference for the tunnel.

   You can specify up to eight levels of preference, and you can assign the same preference to a maximum of 31 tunnels. When you define multiple preferences for a destination, you increase the probability of a successful connection.

   host1(config-tunnel-group-tunnel)#**preference 5**

6. (Optional) Specify an authentication password for the tunnel.

   host1(config-tunnel-group-tunnel)#**password temporary**

NOTE: If you specify a password for the LAC, the router requires that the peer (the LNS) authenticate itself to the router. In this case, if the peer fails to authenticate itself, the tunnel terminates.

7. (Optional) Specify a hostname for the LAC end of the tunnel.

   The LAC sends the hostname to the LNS when communicating to the LNS about the tunnel. The hostname can be up to 64 characters (no spaces).

   host1(config-tunnel-group-tunnel)#**client-name host4.**

NOTE: If the LNS does not accept tunnels from unknown hosts, and if no hostname is specified, the LAC uses the router name as the hostname.

8. (Optional) Specify a server name for the LNS.

   This name specifies the hostname expected from the peer (the LNS) when you set up a tunnel. When this name is specified, the peer must identify itself with this name during tunnel startup. Otherwise, the tunnel is terminated. The server name can be up to 64 characters (no spaces).

   host1(config-tunnel-group-tunnel)#**server-name boston**

9. (Optional) Specify a source IP address for the LAC tunnel endpoint. All L2TP packets sent to the peer use this source address.

   By default, the router uses the virtual router's router ID as the source address. You can override this behavior for an L2TP tunnel by specifying a source address. If you do specify a source address, use the address of a stable IP interface (for example, a loopback interface). Make sure that the address is configured in the virtual router for this domain map, and that the address is reachable by the peer.

   host1(config-tunnel-group-tunnel)#**source-address 192.0.3.3**

10. Specify a tunnel identification.

    host1(config-tunnel-group-tunnel)#**identification acton**

    The router groups L2TP sessions with the same tunnel identification into the same tunnel. This occurs only when both the destination (virtual router, IP address) and the ID are the same.

11. Specify a medium type for the tunnel. (L2TP supports only IP version 4 [IPv4].)

    host1(config-tunnel-group-tunnel)#**medium ipv4**

12. Specify the L2TP tunnel type (RADIUS attribute 64, Tunnel-Type). Currently, the only supported value is L2TP.

    host1(config-tunnel-group-tunnel)#**type l2tp**

13. Verify the L2TP tunnel configuration.

```
host1(config)#show aaa domain-map

Domain: westford.com; router-name: default; ipv6-router-name: default
                                                                    Tunnel
Tunnel   Tunnel         Tunnel        Tunnel   Tunnel    Tunnel    Tunnel   Client
 Tag      Peer           Source        Type    Medium   Password     Id      Name
------   ------------   -----------   ------   ------   ---------  ------   ------
3        192.168.2.13   192.168.3.3   l2tp     ipv4     temporary  acton    host4

         Tunnel                Tunnel                      Tunnel
Tunnel   Server     Tunnel       Max                        Virtual
 Tag      Name    Preference   Sessions     Tunnel RWS      Router
------   ------   ----------   --------   --------------   -------
3        boston   5            0          system chooses   vr2
```

```
host1#show aaa tunnel-parameters
Tunnel password is 3&92k%b#q4
Tunnel client-name is <NULL>
Tunnel nas-port-method is none
Tunnel nas-port ignore disabled
Tunnel nas-port-type ignore disabled
tunnel assignmentId format is assignmentId
aaa tunnel calling number format is descriptive
```

Related Topics

- Mapping User Domain Names to L2TP Tunnels from Domain Map Tunnel Mode on page 296
- **aaa tunnel-group** command
- **address** command
- **client-name** command
- **identification** command
- **medium ipv4** command
- **password** command
- **preference** command
- **router-name** command
- **server-name** command
- **source-address** command
- **tunnel** command
- **type** command

Configuring the RX Speed on the LAC

You can configure the E-series LAC to always generate L2TP Receive (RX) Speed AVP 38. If you do not specify this command, the RX Speed AVP is generated only when the RX speed differs from the TX speed. The AVPs can be used to generate the RADIUS Connect-Info attribute [77] on the LNS.

To set up the router to always generate the Receive Speed (AVP 38), complete the following steps:

1. On the ATM subinterface, configure the advisory receive speed. See *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM* for information about configuring the advisory speed.

   host1(config-subif)#**atm atm1483 advisory-rx-speed 2000**

2. Specify that the RX Speed AVP is always generated. If you do not specify this command, the RX Speed AVP is generated only when the RX speed differs from the TX speed.

   host1(config)#**l2tp rx-connect-speed-when-equal**

Related Topics

- **atm atm1483 advisory-rx-speed** command
- **l2tp rx-connect-speed-when-equal** command

Managing the L2TP Destination Lockout Process

When multiple sets of tunneling parameters are available, L2TP uses a selection algorithm to choose the best tunnel for subscriber traffic. As part of this selection process, the JUNOSe software's L2TP implementation includes a lockout feature in which the router locks out, or disregards, destinations that are assumed to be unavailable.

By default, when a destination becomes unavailable, L2TP locks out that destination for a lockout timeout of 300 seconds (5 minutes). After the lockout timeout expires, L2TP assumes that the destination is now available and includes the destination when performing the selection algorithm.

Modifying the Lockout Procedure

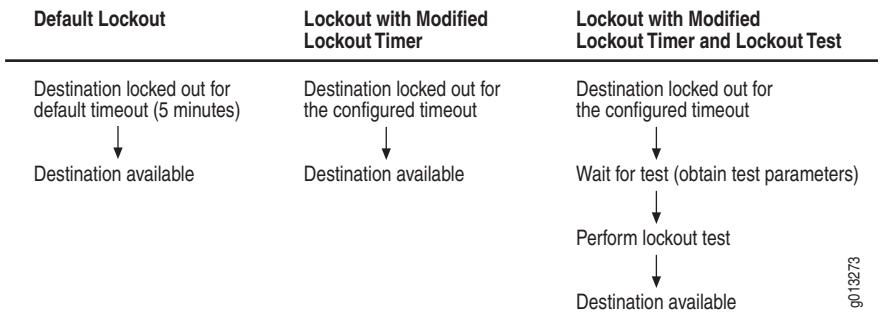
You can optionally configure your own lockout procedure by specifying the lockout timeout you want to use or enabling a lockout test, or both. When the lockout timeout expires, the destination is either immediately unlocked (if lockout testing is not enabled) or begins the lockout test to verify that the destination is available.

L2TP performs the lockout test by attempting to establish a tunnel to the unavailable destination. For the test, L2TP must first obtain the parameters for a tunnel to the destination. If no such tunnel currently exists, L2TP must wait until it receives a new session request that has tunnel parameters for the locked out destination. The destination remains locked out while L2TP waits for the tunnel parameters and becomes available only after successful completion of the lockout test. Therefore, if lockout testing is enabled, the destination is actually locked out longer than the lockout timer you specify.

NOTE: Always configure the lockout timeout to be shorter than the destruct timeout. The destruct timeout (as described in **Specifying a Destruct Timeout for L2TP Tunnels and Sessions** on page 288) overrides the lockout timeout—when the destruct timeout expires, all information about the locked out destination is deleted, including the time remaining on the destination's lockout timeout and the requirement to run a lockout test prior to returning the destination to service. As a result, the locked out destination might be returned to service prior to expiration of your configured lockout timeout and without completion of the lockout test you specified.

Figure 9 shows how locked-out destinations transition from a locked-out state to available status when using the default lockout configuration, a configuration that includes a modified lockout timer, and a configuration with both a modified timer and the lockout test.

Figure 9: Lockout States



You can use the following commands to manage L2TP destination lockout and configure a lockout process that meets the needs of your network environment:

- Use the **l2tp destination lockout-timeout** command to modify the default lockout timeout period.
- Use the **l2tp destination lockout-test** command to configure L2TP to perform a lockout test, which verifies that a currently locked out destination is now available and to include it in the selection algorithm.
- Use the **l2tp unlock destination** command to force L2TP to immediately unlock the specified locked out destination; the destination is then considered to be available by the selection algorithm. L2TP disregards any time remaining in the existing lockout timeout and also disregards the lockout test (if configured).
- Use the **l2tp unlock-test destination** command to force L2TP to immediately begin the lockout testing procedure for the specified destination; any time remaining in the existing lockout timeout is not taken into account.
- Use the **show l2tp** and **show l2tp destination lockout** commands to view information about the L2TP configuration and statistics.

Verifying that a Locked-Out Destination is Available

You can use the **l2tp destination lockout-test** command to configure L2TP to test locked-out destinations; this verifies that a previously locked-out destination is available before the router changes the destination's status.

- To verify the availability of locked out destinations:

  host1(config)#**l2tp destination lockout-test**

Configuring a Lockout Timeout

You use the **l2tp destination lockout-timeout** command to configure the amount of time (in seconds) between when an L2TP destination is found to be unavailable and when it is eligible for unlocking. When the timeout period expires, L2TP either begins the lockout test procedure (if configured to do so) or immediately returns the destination to available state.

BEST PRACTICE: Always configure the lockout timeout to be shorter than the destruct timeout. The destruct timeout (as described in **Specifying a Destruct Timeout for L2TP Tunnels and Sessions** on page 288) overrides the lockout timeout—when the destruct timeout expires, all information about the locked out destination is deleted, including the time remaining on the destination's lockout timeout and the requirement to run a lockout test prior to returning the destination to service.

You can specify a lockout timeout in the range 60–3600 seconds (1 minute–1 hour). The router uses a timeout value of 300 seconds by default.

- To configure an L2TP lockout timeout:

  host1(config)#**l2tp destination lockout-timeout 500**

  The new lockout timeout only affects future locked-out destinations; it does not affect destinations that are currently locked out.

Unlocking a Destination that is Currently Locked Out

You use the **l2tp unlock destination** command to force L2TP to immediately unlock the specified L2TP destination, which is currently locked out and unavailable. L2TP then considers the destination to be available. Any remaining lockout time and the lockout test setting (if configured) are not taken into account.

You must be at privilege level 10 or higher to use this command.

- To unlock a currently locked-out destination:

  host1(config)#**l2tp unlock destination ip 192.168.1.98**

Starting an Immediate Lockout Test

You use the **l2tp unlock-test destination** command to force L2TP to immediately start the lockout test for the specified destination—any remaining lockout time for the destination is ignored.

You must be at privilege level 10 or higher to use this command.

NOTE: If lockout testing is not configured, this command immediately unlocks the destination and L2TP then considers the destination to be available

- To force an immediate lockout test for a specific destination:

  host1(config)#**l2tp unlock-test destination ip 192.169.110.8**

Related Topics

- **l2tp destination lockout-timeout** command
- **l2tp destination lockout-test** command
- **l2tp unlock destination** command
- **l2tp unlock-test destination** command

Managing Address Changes Received from Remote Endpoints

A remote endpoint can use the Start-Control-Connection-Reply (SCCRP) packets that it sends to the E-series LAC to change the address that the LAC uses to communicate with the endpoint. By default, the LAC accepts the change and uses the new address to communicate with the endpoint. However, you can configure the LAC to ignore or reject the requested change. Setting up the LAC to ignore address changes in SCCRP packets enables the router to construct tunnels with separate receive and transmit addresses and to avoid problems due to a misconfiguration. Three possible configurations are available:

- Default configuration—The E-series LAC accepts the change from the endpoint. The LAC then sends all subsequent packets to, and accepts packets from, the new address.
- Ignore configuration (specified by the **l2tp ignore-transmit-address-change** command)—The LAC continues to send packets to the original address but accepts packets from the new address.

  host1(config)#**l2tp ignore-transmit-address-change**

  Use the **ip-address** or **udp-port** keyword to ignore the specific address component. Omit the keywords to ignore the entire address change in the SCCRP packet.
- Reject configuration (specified by the **l2tp reject-transmit-address-change** command)—The LAC sends a Stop-Control-Connection-Notification (StopCCN) to the original address, then terminates the connection to the endpoint.

  host1(config)#**l2tp reject-transmit-address-change ip-address**

  Use the **ip-address** or **udp-port** keyword to reject the specific address component. Omit the keywords to reject the entire address change in the SCCRP packet.

The reject specification takes precedence over the ignore specification.

The router accepts a change in receive address only once, during the tunnel establishment phase, and only on an SCCRP packet. Subsequent changes result in the router dropping packets. Any changes do not affect established tunnels.

Use the **show l2tp** command to display the SCCRP address change configuration.

Related Topics

- **l2tp ignore-transmit-address-change** command
- **l2tp reject-transmit-address-change** command

Configuring LAC Tunnel Selection Parameters

This section presents the capabilities of the LAC's tunnel selection process. L2TP allows you to specify:

- Up to 31 destinations for a domain.
- Up to eight levels of preference. Preference indicates the order in which the router attempts to connect to the destinations specified for a domain. Zero (0) is the highest level of preference.
- Up to 31 destinations for a single preference level.

For information about setting up destinations and preference levels for a domain, see *Mapping a User Domain Name to an L2TP Tunnel Overview* on page 295.

When the E-series LAC determines that a PPP session should be tunneled, it selects a tunnel from a set of tunnels associated with either the PPP user or the PPP user's domain. The router provides the following methods for selecting tunnels:

- Tunnel selection failover between preference levels (the default behavior)
- Tunnel selection failover within a preference level
- Maximum sessions per tunnel
- Weighted load balancing

Configuring the Failover Between Preference Levels Method

When a user tries to log into a domain, in the default method, the router attempts to connect to a destination in that domain with the highest preference level. If more than one destination in the preference level is considered reachable, the router randomly selects a destination and attempts to contact it. If the router is unsuccessful, it marks the destination as unreachable and does not try to connect to that destination for five minutes. The router then moves to the next lower preference level and repeats the process. The router makes up to eight attempts to connect to a destination for a domain—one attempt for each preference level.

If all destinations at a preference level are marked as unreachable, the router chooses the destination that failed first and tries to make a connection. The key is to understand that the router chooses a single destination at each level of preference, even if all destinations have recently failed. Thus the 5-minute timer normally used to reinstate failed destinations is ignored under certain conditions.

For example, suppose you have three destinations for a domain: A, B, and C. You assign the following preferences:

- A, B, and C at preference 0
- A, B, and C at preference 1
- A, B, and C at preference 2

A, B, and C are all considered reachable.

If a PPP user tries to connect to the domain, suppose the router randomly selects destination A from preference 0. If this connection attempt fails, the router excludes destination A for 5 minutes and goes to the next level (preference 1). From here, it randomly selects destination B, one of the two remaining choices. If the second connection attempt also fails, the router excludes destination B, as well as destination A, and attempts to connect to destination C, the only destination available with preference 2. The router has had an opportunity to connect to every destination available for the domain.

Support for multiple destinations affects the procedure for mapping a user domain name to an L2TP tunnel. To learn how to complete this mapping, see *Mapping a User Domain Name to an L2TP Tunnel Overview* on page 295.

- To enable tunnel selection failover between preference levels:

  This tunnel selection method is the default method. If you do not set any tunnel selection parameters, the router uses this method.

Configuring the Failover Within a Preference Level Method

You use the **l2tp fail-over-within-preference** command to enable tunnel selection failover within a preference level.In this selection method, if the router tries to connect to a destination and is unsuccessful, it selects a new destination at the same preference level. If all destinations at a preference level are marked as unreachable, the router does not attempt to connect to a destination at that level. It drops to the next lower preference level to select a destination.

If all destinations at all preference levels are marked as unreachable, the router chooses the destination that failed first and tries to make a connection. If the connection fails, the router rejects the PPP user session without attempting to contact the remote router.

For example, suppose there are four tunnels for a domain: A, B, C, and D. All tunnels are considered reachable, and the preference levels are assigned as follows:

- A and B at preference 0
- C and D at preference 1

When the router attempts to connect to the domain, suppose it randomly selects tunnel B from preference 0. If it fails to connect to tunnel B, the router excludes tunnel B for five minutes and attempts to connect to tunnel A. If this attempt also fails, the router drops to preference 1. Then suppose the router selects tunnel C. If it also fails to connect to tunnel C, the router excludes tunnel C for five minutes and attempts to connect to tunnel D.

- To enable tunnel selection failover within a preference level:

  host1(config)#**l2tp fail-over-within-preference**

Configuring the Maximum Sessions per Tunnel

You can configure the maximum number of sessions per tunnel, either through a RADIUS server or the command-line interface. If you set the maximum sessions per tunnel parameter, the router takes the setting into consideration when it selects a tunnel. If a randomly selected tunnel has a current session count equal to its maximum session count, the router does not attempt to contact that tunnel. Instead, it makes an alternate tunnel selection from the set of reachable tunnels at the same preference level. If no additional reachable tunnels exist at the current preference level, the router drops to the next lower preference level to make the next selection. This process is consistent, regardless of which fail-over scheme is currently running on the router. A tunnel without a configured maximum sessions value has no upper limit on the number of sessions it can support.

The router uses a default value of 0 (zero), which allows unlimited sessions in the tunnel.

- To configure the maximum sessions per tunnel.

  host1(config)#**aaa domain-map lac0ne**
  host1(config-domain-map)#**tunnel 1**
  host1(config-domain-map-tunnel)#**max-sessions 1500**

Configuring the Weighted Load Balancing Method

With the weighted load-balancing method, the router uses the maximum sessions per tunnel to choose among multiple tunnels that share the same preference level.

The weight of a tunnel is proportional to its maximum session limit and the maximum session limits of the other tunnels at the same preference level. The tunnel with the largest maximum session value has the largest weight; the tunnel with the next largest maximum session value has the next largest weight, down to the tunnel with the smallest maximum session value that has the smallest weight. The router uses a round-robin tunnel selection method by default.

- To configure the router to base tunnel selection within a preference level on the maximum sessions per tunnel.

  host1(config)#**l2tp weighted-load-balancing**

Related Topics

- **l2tp fail-over-within-preference** command
- **l2tp weighted-load-balancing** command
- **max-sessions** command

Chapter 13

Configuring an L2TP LNS

An L2TP network server (LNS) is a node that acts as one side of an L2TP tunnel endpoint and is a peer to the LAC. An LNS is the logical termination point of a PPP connection that is being tunneled from the remote system by the LAC. You can configure your E-series router to function as an LNS.

This chapter includes the following topics that provide information for configuring an L2TP LNS on the E-series router:

LNS Configuration Prerequisites

Before you begin configuring the router as an LNS, perform the following steps:

1. Create a virtual router.

   host1(config)#**virtual-router west**

2. Assign a router ID IP address, such as that for a loopback interface, to the virtual router. This address must be reachable by the L2TP peer.

   host1:west(config)#**ip router-id 10.10.45.3**

CAUTION: You must explicitly assign a router ID to a virtual router rather than using a dynamically assigned router ID. A fixed ID is required because every time the ID changes, L2TP must disconnect all existing tunnels and sessions that use the old ID. If you use a dynamically assigned router ID, the value can change without warning, leading to failure of all L2TP tunnels and sessions. Also, the router could dynamically assign a router ID that is not reachable by the L2TP peer, causing a complete failure of L2TP. You must set the router ID even if you specified a source address in the domain map or a local address in the host profile.

Related Topics

- **virtual-router** command
- **ip router-id** command

Configuring an LNS

When you configure an LNS, you can configure it to accept calls from any LAC.

NOTE: If there is no explicit LNS configuration on the router, the UDP port used for L2TP traffic is closed, and no tunnels or sessions can be established.

To enable an LAC to connect to the LNS, you must create the following profiles:

- An L2TP destination profile—Defines the location of each LAC
- An L2TP host profile—Defines the attributes used when communicating with an LAC

NOTE: If you remove a destination profile or modify attributes of a host profile, all tunnels and sessions using the profile will be dropped.

NOTE: If you are using shared tunnel-server ports, you must configure the shared tunnel-server ports before you configure Layer 2 Tunneling Protocol (L2TP) network server (LNS) support. You use the **tunnel-server** command in Global Configuration mode to specify the physical location of the shared tunnel-server port that you want to configure.

See *JUNOSe Physical Layer Configuration Guide, Chapter 6, Managing Tunnel-Service and IPSec-Service Interfaces* for additional information about the **tunnel-server** command and shared tunnel-server ports.

To configure an LNS, perform the following steps:

1. Create a destination profile that defines the location of the LAC, and access L2TP Destination Profile Configuration mode. See *Creating an L2TP Destination Profile* on page 315.

   ```
   host1:boston(config)#l2tp destination profile boston4 ip address 192.168.76.20
   host1:boston(config-l2tp-dest-profile)#
   ```

2. Define the L2TP host profile and enter L2TP Destination Profile Host Configuration mode. See *Creating an L2TP Host Profile* on page 315.

   ```
   host1:boston(config-l2tp-dest-profile)#remote host default
   host1:boston(config-l2tp-dest-profile-host)#
   ```

3. (Optional) Assign a profile name for a remote host.

   ```
   host1:boston(config-l2tp-dest-profile-host)#profile georgeProfile1
   ```

4. (Optional) Disable the use of proxy LCP when connecting to the selected host.

   ```
   host1(config-l2tp-dest-profile-host)#disable proxy lcp
   ```

5. (Optional) Enable the use of proxy authentication when connecting to the selected host.

   ```
   host1(config-l2tp-dest-profile-host)#enable proxy authenticate
   ```

6. (Optional) Specify the local hostname to be used in any hostname AVP sends to the LAC. By default, the router name is used as the local hostname.

   ```
   host1(config-l2tp-dest-profile-host)#local host andy
   ```

7. (Optional) Specify the local IP address to be used in any packets sent to the LAC. By default, the router ID is used.

   ```
   host1(config-l2tp-dest-profile-host)#local ip address 192.168.23.1
   ```

8. (Optional) Specify the shared secret used to authenticate the tunnel. By default, there is no tunnel authentication.

   ```
   host1:boston(config-l2tp-dest-profile-host)#tunnel password saco
   ```

9. (Optional) Specify that L2TP create an MLPPP interface when LCP proxy data is not forwarded from the LAC.

   For example, the MLPPP interface is created if the LAC does not send the initial received or last received LCP configuration request. If full LCP proxy data is available, this command is ignored.

   host1:boston(config-l2tp-dest-profile-host)#**default-upper-type mlppp**

NOTE: When acting as the LNS, the E-series router supports dialed number identification service (DNIS). With DNIS, if users have a called number associated with them, the router searches the domain map for the called number. If it finds a match, the router uses the matching domain map entry information to authenticate the user. If the router does not find a match, it searches the domain map using normal processing. See *Using DNIS* in *Chapter 1, Configuring Remote Access*.

Related Topics

- Creating an L2TP Destination Profile on page 315
- Creating an L2TP Host Profile on page 315
- Configuring the Maximum Number of LNS Sessions on page 316
- Configuring the RADIUS Connect-Info Attribute on the LNS on page 317
- Selecting Tunnel-Service Modules for LNS Sessions Using MLPPP on page 317
- **bundled-group-id** command
- **bundled-group-id-overrides-mlppp-ed** command
- **default-upper-type mlppp** command
- **disable proxy lcp** command
- **enable proxy authenticate** command
- **l2tp destination profile** command
- **local host** command
- **local ip address** command
- **max-sessions** command
- **radius connect-info-format** command
- **remote host** command
- **tunnel password** command

Creating an L2TP Destination Profile

You use the **l2tp destination profile** command to create the destination profile that defines the location of the LAC, and to access L2TP Destination Profile Configuration mode.

If no virtual router is specified with the command, the current virtual router context is used.

If the destination address is 0.0.0.0, then any LAC that can be reached via the specified virtual router is allowed to access the LNS. If the destination address is nonzero, then it must be a host-specific IP address.

- To create a destination profile:

```
host1:boston(config)#l2tp destination profile boston ip address 10.10.76.12
host1:boston(config-l2tp-dest-profile)#
```

NOTE: When you change an L2TP destination profile, you must wait for the router to delete all L2TP tunnels associated with the deleted profile before you create the new profile.

If you remove a destination profile, all tunnels and sessions using that profile will be dropped.

Related Topics

- Creating an L2TP Host Profile on page 315
- **remote host** command

Creating an L2TP Host Profile

Use the **remote host** command to define the L2TP host profile and access L2TP Destination Profile Host Configuration mode.

- Each L2TP destination profile can have multiple L2TP host profiles.
- For an LAC to connect to an LNS, the appropriate L2TP destination profile *must* have at least one L2TP host profile.
- If you specify any name other than *default* for the remote host, then the LAC must supply the specified hostname in order for the tunnel to be set up. The remote hostname is matched against the hostname AVP in the received Start-Control-Connection-Request (SCCRQ).
- The remote hostname can be up to 64 characters (no spaces).

- Example

  host1:boston(config)#**l2tp destination profile boston1 ip address 192.168.76.12**
  host1:boston(config-l2tp-dest-profile)#**remote host default**
  host1(config-l2tp-dest-profile-host)#

- Use the **no** version to remove the L2TP host profile.

NOTE: If you modify any attributes of a host profile, all tunnels and sessions using that profile will be dropped.

Related Topics

- Creating an L2TP Destination Profile on page 315
- **l2tp destination profile** command

Configuring the Maximum Number of LNS Sessions

You can use the **max-sessions** command in both L2TP Destination Profile Configuration mode and L2TP Destination Profile Host Configuration mode to configure the number of sessions allowed by the L2TP network server (LNS).

The LNS uses a two-step process to ensure that the maximum number of allowed sessions is not exceeded. When a session is requested, the LNS first checks the maximum sessions set for the L2TP destination profile. If no limit is set, or if the current count is less than the configured limit, the LNS then performs the same check on the L2TP destination host profile limit. If the current count is also less than the L2TP destination host profile limit, then the new session can be established. If a session request exceeds either of the max-sessions settings, the LNS rejects the session.

NOTE: New sessions are rejected once the chassis-wide session limit is exceeded, even if the destination profile or host profile maximum session limit is not exceeded. For information about the maximum number of L2TP sessions supported per chassis, see *JUNOSe Release Notes*, *Appendix A*, *System Maximums*.

- To set the maximum sessions allowed for the specified destination, use the **max-sessions** command in L2TP Destination Profile Configuration mode:

  host1(config)#**l2tp destination profile westford ip address 10.10.21.2**
  host1(config-l2tp-destination-profile)#**max-sessions 20000**

- To set the maximum session allowed for the specified host, use the **max-sessions** command in L2TP Destination Profile Host Configuration mode:

  host1(config-dest-profile))#**remote host default**
  host1(config-l2tp-destination-profile-host)#**max-sessions 20000**

Related Topics

- **max-sessions** command

Configuring the RADIUS Connect-Info Attribute on the LNS

You can configure the LNS to generate the RADIUS Connect-Info attribute [77]. Service providers can then use the information in the RADIUS attribute to identify a customer's service.

On the LNS, the Connect-Info attribute is based on the L2TP connect-speed AVPs received from the LAC. The LNS does not generate the attribute by default. The format of the Connect-Info attribute is as follows, where the TX speed and RX speed are equal to the respective L2TP AVPs:

```
tx-speed [ /rx-speed ]
```

The TX speed is always included in the attribute when the speed is not zero; however, inclusion of the RX speed depends on the keyword you use with the command.

- Use the **l2tp-connect-speed** keyword to specify that the RX speed is only included when it is not zero and also is different than the TX speed.

  ```
  host1(config)#radius connect-info-format l2tp-connect-speed
  ```

- Use the **l2tp-connect-speed-rx-when-equal** keyword to specify that the RX speed is always included when it is not zero.

  ```
  host1(config)#radius connect-info-format l2tp-connect-speed-rx-when-equal
  ```

Related Topics

- **radius connect-info-format** command

Selecting Tunnel-Service Modules for LNS Sessions Using MLPPP

You can install multiple tunnel-service modules in an E-series router deployed as an LNS where the tunnel sessions carry MLPPP. To use an LNS, at least one Service line module (SM), ES2-S1 Service IOA, or a module that supports the use of shared tunnel-server ports must be installed in the E-series router.

The router selects tunnel-service modules based on the LNS sessions that underlie the PPP link interfaces of an MLPPP bundle, also known as *bundled sessions*. To determine the appropriate SM where it places the first bundled session for an MLPPP bundle, the router uses a load-balancing mechanism. After the router determines the appropriate SM, it places all sessions for the same bundle on the same SM. By default, the router determines *bundled membership* based on the endpoint discriminator that the LNS receives from the LAC in the proxy LCP information.

For example, an ERX-1440 router has tunnel-service modules installed in slots 4, 9, and 12. Using the load-balancing mechanism, the router determines that the SM in slot 4 can accommodate the first bundled session for MLPPP bundle A, and places it there. The first bundled session for bundle A has an endpoint discriminator of 5. The router subsequently places all bundled sessions for bundle A (which have an endpoint discriminator of 5) on the SM in slot 4.

When the SM on which the bundled sessions reside has no more space for additional sessions, the router refuses the L2TP session. This can happen even when other tunnel-service modules installed in the router have available space.

For more information about endpoint discriminators, see *JUNOSe Link Layer Configuration Guide, Chapter 8, Configuring Multilink PPP*.

Assigning Bundled Group Identifiers

In some cases, an endpoint discriminator is not available for the LNS to use to identify the links in a bundled session.

This situation might occur when:

- PPP clients provide endpoint discriminators with null values.
- PPP clients do not provide an endpoint discriminator option when negotiating LCP with the LAC.
- The LAC does not include a endpoint discriminator option in the LCP proxy AVPs.

The router places all bundled sessions without endpoint discriminators on the same SM. However, if there are many such bundled sessions, the load-balanced distribution of LNS sessions across the tunnel-service modules can deteriorate because the router places all bundled sessions on the same SM without evenly distributing the load.

The **bundled-group-id** command enables you to correct this situation by assigning a numeric bundled group identifier for the router to use when the endpoint discriminator is unavailable to identify the bundled membership. The router places bundled sessions with the same bundled group identifier on the same SM in the same way that it does with endpoint discriminators.

The bundled group identifier applies to the entire router; therefore, if you assign the same bundled group identifier for different L2TP destination host profiles, the router places all of the bundled sessions with the same bundled group identifier on the same SM.

NOTE: We recommend that you assign bundled group identifiers only when you are certain that endpoint discriminators are unavailable to identify bundle membership.

- To assign a numeric bundled group identifier:

```
host1:boston(config-l2tp-dest-profile-host)#bundled-group-id 4
```

Overriding All Endpoint Discriminators

NOTE: We strongly recommend that you use this feature only with the support of JTAC.

You can also configure the router to ignore the value of all endpoint discriminators when it selects a SM and to use only the bundled group identifier that you assigned by issuing the **bundled-group-overrides-mlppp-ed** command.

Issuing the **bundled-group-id** and **bundled-group-id-overrides-mlppp-ed** commands together forces the router to place the bundled sessions on the same SM when a PPP client incorrectly specifies different endpoint discriminators for links in the same bundle.

- To configure the router to ignore the value of all endpoint discriminators:

  host1:boston(config-l2tp-dest-profile-host)#**bundled-group-id-overrides-mlppp-ed**

Related Topics

- **bundled-group-id** command
- **bundled-group-id-overrides-mlppp-ed** command

Enabling Tunnel Switching

L2TP tunnel switching allows you to switch packets between one session terminating at an L2TP LNS and another session originating at an L2TP LAC. What distinguishes a tunnel-switched LAC from a conventional one is that there are two interface columns: one for the incoming session (LNS) and one for the outgoing session (LAC). The router forwards traffic from the incoming session to the outgoing session and vice versa.

You can select tunnel switching on a per-chassis basis. By default, tunnel switching is disabled. This preserves current behavior and prevents inadvertent attempts to switch tunnels.

NOTE: Each individual L2TP session involved in tunnel switching is counted toward the maximum number of sessions supported on an E-series router.

- To enable tunnel switching:

  host1(config)#**l2tp tunnel-switching**

Related Topics

- **l2tp tunnel-switching** command

Creating Persistent Tunnels

The E-series router supports persistent tunnels. A persistent tunnel is one that is configured to remain available. Persistent tunnels have only local significance; that is, they apply only to the end of the tunnel where they are set. If the other end of the tunnel chooses to terminate the tunnel, the tunnel is removed.

- To create a persistent tunnel, you configure an idle-timeout value of zero.

  host1(config)#**l2tp tunnel idle-timeout 0**

Related Topics

- **l2tp tunnel idle-timeout** command

Testing Tunnel Configuration

You can use the **l2tp tunnel test** command to force the establishment of a tunnel—this enables you to verify both the tunnel configuration and connectivity.

This command supports tunnel initiation: incoming calls on the LAC; outgoing calls on the LNS. The command does not support tunnel respondent: outgoing calls on the LAC; incoming calls on the LNS.

- To test a tunnel configuration:

  host1#**l2tp tunnel test portland.com gold**

Related Topics

- **l2tp tunnel test** command

Managing L2TP Destinations, Tunnels, and Sessions

When the router is established as an LNS you can manage the destinations, tunnels and sessions.

- Enable the verification of data integrity via UDP.
- Specify the time period for which the router maintains dynamic destinations, tunnels, or sessions after termination.
- Prevent the creation of new sessions, tunnels, and destinations.
- Close and reopen all or selected destinations, tunnels, and sessions.
- Configure drain timeout operations, which control the amount of time a disconnected LAC tunnel waits before restarting after receiving a restart request.
- Configure how many times the router retries a transmission if the initial attempt is unsuccessful.

Related Topics

- *Generating UDP Checksums in Packets to L2TP Peers* in *Chapter 12, Configuring an L2TP LAC*
- *Specifying a Destruct Timeout for L2TP Tunnels and Sessions* in *Chapter 12, Configuring an L2TP LAC*
- *Preventing Creation of New Destinations, Tunnels, and Sessions* in *Chapter 12, Configuring an L2TP LAC*
- *Shutting Down Destinations, Tunnels, and Sessions* in *Chapter 12, Configuring an L2TP LAC*
- *Specifying the Number of Retransmission Attempts* in *Chapter 12, Configuring an L2TP LAC*

Configuring Disconnect Cause Information

You can configure an E-series LNS to convey PPP-related disconnect cause information to its L2TP peer. Enabling an LNS to send disconnect cause information to an LAC is particularly useful in an environment where the LAC initiates tunnels without a client's request, knowledge, or approval. In this type of environment, all PPP signaling for the tunnel session takes place between the LNS and the client, without active participation of the LAC. As a result, the LAC is not aware of the reason that a session has disconnected.

NOTE: An E-series LAC does not send PPP Disconnect Case Code AVPs to an LNS. In the event that a third-party LAC does send the AVP to an E-series LNS, the LNS discards the AVP.

Generating the Disconnect Cause AVP Globally

You use the **l2tp disconnect-cause** command to specify that the LNS include the PPP Disconnect Cause Code AVP in all L2TP Call-Disconnect-Notify (CDN) messages that it sends to the LAC. For example, this feature enables the LAC to obtain information about the cause of a session disconnection,

- To enable disconnect cause generation chassis-wide on the LNS:

  host1(config)#**l2tp disconnect-cause**

NOTE: Sessions for which the AVP generation is enabled by the host-profile-specific **disconnect-cause** command continue to generate the AVP.

Generating the Disconnect Cause AVP with a Host Profile

You use the **disconnect-cause** command in L2TP Destination Profile Host Configuration mode to specify that the E-series LNS generate PPP Disconnect Cause Code AVPs. This command pertains only to L2TP sessions to which the L2TP destination host profile applies. The AVP is included in all L2TP CDN messages that the LNS sends to an LAC for covered sessions.

NOTE: This command is used only for dial-in sessions; use the **l2tp disconnect-cause** command in Global Configuration mode to generate PPP Disconnect Cause Code AVPs for dial-out sessions.

- To enable disconnect cause generation for all tunnels that use a particular host profile on the LNS:

  host1(config-l2tp-dest-profile-host)#**disconnect-cause**

Enabling RADIUS Accounting for Disconnect Cause

You use the **radius include l2tp-ppp-disconnect-cause acct-stop enable** command to specify that the Disconnect-Cause RADIUS attribute (VSA 26-51) is generated and included in RADIUS acct-stop and acct-tunnel-link-stop records. RADIUS VSA 26-51 is not included in the accounting records by default.

At the LAC, this accounting reports remotely generated disconnect cause information received from the LNS. At the LNS, the accounting reports locally generated disconnect cause information.

- To enable disconnect cause accounting:

  host1(config)#**radius include l2tp-ppp-disconnect-cause acct-stop enable**

Displaying Disconnect Cause Statistics

You can display chassis-wide summary statistics for all disconnect cause information received by the LAC, sorted by code number.

- To display summary statistics for disconnect cause information:

  host1(config)#**show l2tp received-disconnect-cause-summary**

Related Topics

- **disconnect-cause** command
- **l2tp disconnect-cause** command
- **radius include l2tp-ppp-disconnect-cause acct-stop enable** command

Configuring the Receive Window Size

You can configure the L2TP receive window size (RWS) for an L2TP tunnel. L2TP uses the RWS to implement a sliding window mechanism for the transmission of control messages.

When you configure the RWS, you specify the number of packets that the L2TP peer can transmit without receiving an acknowledgment from the router. If the RWS is not configured, the router determines the RWS and uses this value for all new tunnels on both the LAC and the LNS.

You can configure the L2TP RWS in the following ways:

- Configure the systemwide default RWS setting for a tunnel on both the LAC and the LNS by using the **l2tp tunnel default-receive-window** command (in Global Configuration mode).
- Configure the RWS for a tunnel on the LAC by using either the **receive-window** command (in Domain Map Tunnel Configuration mode) or by including the L2tp-Recv-Window-Size RADIUS attribute (VSA 26-54) in RADIUS Access-Accept messages.
- Configure the RWS for all tunnels that use a particular host profile on the LNS by using the **receive-window** command (in L2TP Destination Profile Host Configuration mode).

Configuring the Default Receive Window Size

Use the **l2tp tunnel default-receive-window** command to configure the default L2TP RWS for a tunnel on both the LAC and the LNS. The default L2TP RWS is the number of packets that the L2TP peer can transmit without receiving an acknowledgment from the router. The only supported value is 4.

To configure the default RWS setting:

1. From Global Configuration mode, set the L2TP default RWS. The only value supported for the default RWS is 4.

   host1(config)#**l2tp tunnel default-receive-window 4**

   The router uses this RWS value for all new tunnels on both the LAC and the LNS. The new command has no effect on previously configured tunnels.

2. (Optional) Use the **show l2tp** command to verify the default RWS configuration.

```
host1#show l2tp
Configuration
  L2TP administrative state is enabled
  Dynamic interface destruct timeout is 600 seconds
  Data packet checksums are disabled
  Receive data sequencing is not ignored
  Tunnel switching is disabled
  Retransmission retries for established tunnels is 5
  Retransmission retries for not-established tunnels is 5
  Tunnel idle timeout is 60 seconds
  Failover within a preference level is disabled
  Weighted load balancing is disabled
```

```
  Tunnel authentication challenge is enabled
  Calling number avp is enabled
  Ignore remote transmit address change is disabled
  Disconnect cause avp is disabled
  Default receive window size is 4
Sub-interfaces      total      active     failed     auth-errors
  Destinations      0          0          0          n/a
  Tunnels           0          0          0          0
  Sessions          0          0          0          n/a
  Switched-sessions 0          0          0          n/a
```

Configuring the Receive Window Size on the LAC

Use the **receive-window** command to configure the L2TP RWS for a tunnel on the LAC. Use the **no** version of the command to revert to the systemwide RWS setting configured with the **l2tp tunnel default-receive-window** command.

TIP: The RWS setting must be the same for all users of the same tunnel.

If you modify the RWS setting for an existing tunnel, subsequent tunnel users might be not be able to log in if their RWS setting conflicts with the new RWS setting for the tunnel.

To configure the RWS for a tunnel on the LAC:

1. Access Domain Map Tunnel Configuration mode as described in *Mapping a User Domain Name to an L2TP Tunnel Overview* in *Chapter 12, Configuring an L2TP LAC*. For example:

   ```
   host1(config)#aaa domain-map fms.com
   host1(config-domain-map)#router-name westford
   host1(config-domain-map)#tunnel 3
   host1(config-domain-map-tunnel)#
   ```

2. From Domain Map Tunnel Configuration mode, set the tunnel RWS. The only value supported for the tunnel RWS is 4, and it must be the same for all users of the same tunnel.

   ```
   host1(config-domain-map-tunnel)#receive-window 4
   ```

3. (Optional) Use the **show aaa domain-map** command to verify the RWS configuration.

   ```
   host1#show aaa domain-map

   Domain: fms.com; router-name: westford; ipv6-router-name: default
                                                                    Tunnel
   Tunnel   Tunnel   Tunnel   Tunnel   Tunnel    Tunnel    Tunnel   Client
    Tag      Peer    Source    Type    Medium   Password     Id      Name
   ------   ------   ------   ------   ------   --------   ------   ------
   3        <null>   <null>   l2tp     ipv4     <null>     <null>   <null>
            Tunnel                 Tunnel
   Tunnel   Server     Tunnel       Max      Tunnel
    Tag      Name    Preference   Sessions    RWS
   ------   ------   ----------   --------   ------
   3        <null>   2000         0          4
   ```

You can also configure the RWS for a tunnel on the LAC by including the L2tp-Recv-Window-Size RADIUS attribute (VSA 26-54) in RADIUS Access-Accept messages. For more information about RADIUS Access-Accept messages, see *Chapter 3, Configuring RADIUS Attributes*. For more information about the L2tp-Recv-Window-Size attribute, see *Chapter 6, RADIUS Attribute Descriptions*.

Configuring the Receive Window Size on the LNS

Use the **receive-window** command to configure the L2TP RWS for a tunnel on the LNS. Use the **no** version of the command to revert to the systemwide RWS setting configured with the **l2tp tunnel default-receive-window** command.

To configure the RWS for a tunnel on the LNS:

1. Access L2TP Destination Profile Host Configuration mode. For example:

```
host1(config)#virtual-router fms02
host1:fms02(config)#l2tp destination profile fms02 ip address 192.168.5.61
host1:fms02(config-l2tp-dest-profile)#remote host fms03
host1:fms02(config-l2tp-dest-profile-host)#
```

2. From Destination Profile Host Configuration mode, set the tunnel RWS. The only value supported for the tunnel RWS is 4.

```
host1:fms02(config-l2tp-dest-profile-host)#receive-window 4
```

TIP: If you modify the RWS setting of a host profile for an existing tunnel, the router drops the tunnel. This action is consistent with router behavior when you modify an L2TP host profile.

3. (Optional) Use the **show l2tp destination profile** command to verify the RWS configuration.

```
host1:fms02#show l2tp destination profile fms02
L2TP destination profile fms02
Destination address
  Transport ipUdp
  Virtual router fms02
  Peer address 192.168.5.61
Host profile attributes
  Remote host is fms03
    Receive window size is 4
1 L2TP host profile found
```

Related Topics

- **l2tp tunnel default-receive-window** command
- **receive-window** command

Configuring Peer Resynchronization

The JUNOSe software enables you to configure the peer resynchronization method you want the router to use. Peer resynchronization enables L2TP to recover from a router warm start and to allow an L2TP failed endpoint to resynchronize with its peer non-failed endpoint.

L2TP peer resynchronization:

- Prevents the non-failed endpoint from prematurely terminating a tunnel while the failed endpoint is recovering
- Reestablishes the sequence numbers required for the operation of the L2TP control protocol
- Resolves inconsistencies in the tunnel and session databases of the failed endpoint and the non-failed endpoint

To ensure successful peer resynchronization between endpoints, the non-failed endpoint must support a complete RFC-compliant L2TP implementation.

JUNOSe software supports both the L2TP silent failover method and the L2TP failover protocol method, which is described in Fail Over extensions for L2TP "failover" draft-ietf-l2tpext-failover-06.txt. You can configure L2TP to use the failover protocol method as the primary peer resynchronization method, but then fall back to the silent failover method if the peer does not support the failover protocol method.

The following list highlights differences between the failover protocol and silent failover peer resynchronization methods:

- With the L2TP failover protocol method, both endpoints must support the method or recovery always fails. The L2TP failover protocol method also requires a non-failed endpoint to wait an additional recovery time period while the failed endpoint is recovering to prevent the non-failed endpoint from prematurely disconnecting the tunnel. The additional recovery period makes L2TP less responsive to the loss of tunnel connectivity.
- Silent failover operates entirely within the failed endpoint and does not require non-failed endpoint support—this improves interoperability between peers. Silent failover does not require additional recovery time by the non-failed endpoint, which also eliminates the potential for degraded responsiveness to the loss of tunnel connectivity.

NOTE: L2TP silent failover is not supported on E3 ATM and CT1 line modules in peer-facing configurations.

You can use the CLI or RADIUS to configure the resynchronization method for your router.

Configuring Peer Resynchronization for L2TP Host Profiles and AAA Domain Map Tunnels

The JUNOSe CLI enables you to configure the peer resynchronization method globally, for a host profile, or for a domain map tunnel. A host profile or domain map tunnel configuration takes precedence over the global peer resynchronization configuration.

When you change the peer resynchronization method, the change is not immediately applied to existing tunnels. Tunnels continue using their current resynchronization method until the next time the tunnel is reestablished.

Use the **failover-resync** command to configure the L2TP peer resynchronization method for L2TP host profiles and AAA domain map tunnels. This command takes precedence over the global peer resynchronization configuration.

Choose one of the following keywords to specify the peer resynchronization method:

- **failover-protocol**—The tunnel uses the L2TP failover protocol method. If the peer non-failed endpoint does not support the L2TP failover protocol, a failover forces disconnection of the tunnel and all of its sessions.
- **failover-protocol-fallback-to-silent-failover**—The tunnel uses the L2TP failover protocol method; however, if the peer non-failed endpoint does not support the L2TP failover protocol method, the tunnel falls back to using the silent failover method.
- **silent-failover**—The tunnel uses the silent failover method. The tunnel also informs its peer that it supports the failover protocol method for the peer's failovers.
- **disable**—The tunnel does not use any peer resynchronization method for its own failovers, The tunnel informs its peer that it supports the failover protocol method for the peer's failovers. A failover forces the disconnection of the tunnel and all of its sessions.
- **not-configured**—Peer resynchronization is not configured for L2TP host profiles and AAA domain map tunnels. L2TP uses the global failover method.

By default, peer resynchronization is not configured at the L2TP profile-level or the domain map-level—therefore, the global configuration is used. This is different than using the **disable** keyword, which specifies that no peer synchronization method is used.

Use the **show l2tp destination profile** command to display a host profile's peer resynchronization configuration and the **show aaa domain-map** command to display a domain map's configuration.

- To configure peer resynchronization for an L2TP host profile:

```
host1(config)#l2tp destination profile lac-dest ip address 192.168.20.2
host1(config-l2tp-dest-profile)#remote host lac-host
host1(config-l2tp-dest-host-profile-host)#failover-resync silent-failover
```

- To configure peer resynchronization for an AAA domain map tunnel:

  ```
  host1(config)#aaa domain-map lac-tunnel
  host1(config-domain-map)#tunnel 10
  host1(config-domain-map-tunnel)#failover-resync silent-failover
  ```

Configuring the Global L2TP Peer Resynchronization Method

You can configure the peer resynchronization method globally, or for L2TP host profiles or domain map tunnels—a host profile or domain map tunnel configuration takes precedence over the global peer resynchronization configuration.

When you change the peer resynchronization method, the change is not immediately applied to existing tunnels. Tunnels continue using their current resynchronization method until the next time the tunnel is reestablished.

Use the **l2tp failover-resync** command to configure the global L2TP peer resynchronization method that L2TP failed endpoints use to resynchronize with a peer non-failed endpoint.

Choose one of the following keywords to specify the peer resynchronization method. All tunnels in the chassis use the specified method unless it is overridden by an L2TP host profile configuration or an AAA domain map configuration.

- **failover-protocol**—Tunnels use the L2TP failover protocol method. If the peer non-failed endpoint does not support the L2TP failover protocol, a failover forces disconnection of all tunnels and their sessions.
- **failover-protocol-fallback-to-silent-failover**—Tunnels use the L2TP failover protocol method; however, if the peer non-failed endpoint does not support the L2TP failover protocol method, the tunnel falls back to using the silent failover method.
- **silent-failover**—Tunnels use the silent failover method. The tunnels also inform their peers that they support the failover protocol method for peer failovers.
- **disable**—Tunnels do not use any peer resynchronization method for their own failovers. Tunnels inform their peers that they support the failover protocol method for peer failovers. A failover forces the disconnection of all tunnels and sessions.

Use the **show l2tp** command to display the global peer resynchronization configuration.

- To configure peer resynchronization for an L2TP host profile or AAA domain map tunnel:

  ```
  host1(config)#l2tp failover-resync silent-failover
  ```

- To restore the global default setting, which uses the **failover-protocol-fallback-to-silent-failover** method:

  ```
  host1(config)#default l2tp failover-resync
  ```

- To disable peer resynchronization, use the **no** version of the command—this is the same as using the **disable** keyword:

  host1(config)#**no l2tp failover-resync**

Using RADIUS to Configure Peer Resynchronization

The JUNOSe software supports the use of RADIUS to configure the L2TP peer resynchronization method used by your L2TP tunnels. You use the L2TP-Resynch-Method RADIUS attribute (VSA 26-90) in RADIUS Access-Accept messages to specify the L2TP peer resynchronization method.

Table 66 describes the L2TP-Resynch-Method RADIUS attribute. For more information about RADIUS Access-Accept messages, see *Chapter 3, Configuring RADIUS Attributes*. For more information about the L2TP-Resynch-Method attribute, see *Appendix 6, RADIUS Attribute Descriptions*.

Table 66: L2TP-Resynch-Method RADIUS Attribute

Standard Number	Attribute Name	Description	Length	Subtype Length	Value
[26-90]	L2TP-Resynch-Method	L2TP peer resynchronization method	12	6	integer: ■ 0 = disabled ■ 1 = failover protocol ■ 2 = silent failover ■ 3 = failover protocol with silent failover as backup

Related Topics

- **failover-resync** command
- **l2tp failover-resync** command

Configuring L2TP Tunnel Switch Profiles

You can use the **l2tp switch-profile** command to create an L2TP tunnel switch profile. An *L2TP tunnel switch profile* is a set of characteristics that defines the behavior of L2TP tunnel switching for the interfaces to which the profile is assigned.

Within the L2TP tunnel switch profile, you configure a particular tunnel switching behavior for a specified L2TP AVP. For example, you can configure the router to preserve the value of (relay) a specified AVP type across the LNS/LAC boundary in an L2TP tunnel-switched network.

Applying the L2TP Tunnel Switch Profile

Configuring an L2TP tunnel switch profile has no effect by itself. To use the tunnel switch profile in an L2TP tunnel-switched network, you must apply it to an L2TP outbound LAC session by using one of the following methods:

- Authentication, authorization, and accounting (AAA) domain maps
- AAA tunnel groups
- RADIUS Access-Accept messages

If none of these methods are used, you can apply the L2TP tunnel switch profile as an AAA default tunnel parameter. The default tunnel switch profile has lower precedence than the other methods for applying the tunnel switch profile.

For more information about the methods for applying L2TP tunnel switch profiles, see *Configuration Tasks* on page 331.

Configuration Guidelines

The following rules apply when you configure L2TP tunnel switch profiles:

- L2TP tunnel switching must be enabled for tunnel switch profiles to take effect. For information, see *Enabling Tunnel Switching on the Router* on page 332.
- L2TP tunnel switch profiles have no effect when they are assigned to a LAC session that is not tunnel switched.
- The router can relay only those AVPs that are accepted at the LNS. Malformed AVPs are never relayed.
- If a tunnel grant response specifies a named tunnel switch profile that has not been configured on the router, the router prohibits connection of the L2TP tunnel-switched session.
- If you remove a tunnel switch profile, the router also disconnects all associated L2TP switched sessions using that profile.
- In some cases, attributes configured in a tunnel switch profile take precedence over similar attributes configured globally on the router.

  For example, configuring L2TP Calling Number AVP 22 for relay overrides the **l2tp disable calling-number-avp** command issued from Global Configuration mode to prevent the router from sending AVP 22 in incoming-call-request (ICRQ) packets. In this scenario, the router relays the Calling Number AVP.

Configuring L2TP AVPs for Relay

Previously, the router did not preserve the values of incoming L2TP AVPs across the LNS/LAC boundary in an L2TP tunnel-switched network. The router regenerated most incoming AVPs, such as L2TP Calling Number AVP 22, based on the local policy in effect. However, some AVPs, such as Cisco NAS Port Info AVP 100, were dropped.

In an L2TP tunnel switch profile, you can define the types of AVPs that the router can relay unchanged across the LNS/LAC boundary. You can specify that the router relay one or more of the following AVP types:

- L2TP Bearer Type AVP 18
- L2TP Calling Number AVP 22
- Cisco NAS Port Info AVP 100

When you configure any of these AVP types for relay in an L2TP tunnel-switched network, the router preserves the value of an incoming AVP of this type when packets are switched between the inbound LNS session and the outbound LAC session.

Configuration Tasks

To configure and use an L2TP tunnel switch profile in an L2TP tunnel-switched network:

1. Ensure that L2TP tunnel switching is enabled on the router.
2. Configure the L2TP tunnel switch profile.
3. Apply the L2TP tunnel switch profile to the tunnel in one of the following ways:
    - To apply a named tunnel switch profile through an AAA domain map, use the **switch-profile** command from Domain Map Tunnel Configuration mode. For details, see *Applying L2TP Tunnel Switch Profiles by Using AAA Domain Maps* on page 333.
    - To apply a named tunnel switch profile through an AAA tunnel group, use the **switch-profile** command from Tunnel Group Tunnel Configuration mode. For details, see *Applying L2TP Tunnel Switch Profiles by Using AAA Tunnel Groups* on page 334.
    - To apply a named tunnel switch profile through RADIUS, include the Tunnel-Switch-Profile RADIUS attribute (VSA 26-91) in RADIUS Access-Accept messages. For details, see *Applying L2TP Tunnel Switch Profiles by Using RADIUS* on page 335.
    - To apply a default tunnel switch profile to a virtual router, use the **aaa tunnel switch-profile** command from Global Configuration mode. For details, see *Applying Default L2TP Tunnel Switch Profiles* on page 334.

The following sections describe how to perform each of these tasks.

Enabling Tunnel Switching on the Router

To enable L2TP tunnel switching on the router, use the **l2tp tunnel-switching** command. By default, tunnel switching is disabled.

- To enable L2TP tunnel switching:

  ```
  host1(config)#l2tp tunnel-switching
  ```

For more information, see *Enabling Tunnel Switching* on page 319.

Configuring L2TP Tunnel Switch Profiles

To configure an L2TP tunnel switch profile:

1. Create the L2TP tunnel switch profile and assign it a name. The **l2tp switch-profile** command accesses L2TP Tunnel Switch Profile Configuration mode.

   ```
   host1(config)#l2tp switch-profile concord
   host1(config-l2tp-tunnel-switch-profile)#
   ```

2. Configure the L2TP tunnel switching behavior for the interfaces to which this profile is assigned. Use the **avp** command with the **relay** keyword to cause the router to preserve the value of an incoming AVP of this type when packets are switched between an inbound LNS session and an outbound LAC session.

   You can use any of the following keywords to specify the AVPs for the router to relay:

   - **bearer-type**—L2TP Bearer Type AVP 18; by default, the router regenerates this AVP at the outbound LAC session, based on the local policy in effect
   - **calling-number**—L2TP Calling Number AVP 22; by default, the router regenerates this AVP at the outbound LAC session, based on the local policy in effect
   - **cisco-nas-port**—Cisco NAS Port Info AVP 100; by default, the router drops this AVP

   Use the **no** version to restore the default L2TP tunnel switching behavior (regenerate or drop) for incoming AVPs of the specified type.

   The following commands configure the router to relay the Bearer Type, Calling Number, and Cisco NAS Port Info AVP types across the LNS/LAC boundary.

   ```
   host1(config-l2tp-tunnel-switch-profile)#avp bearer-type relay
   host1(config-l2tp-tunnel-switch-profile)#avp calling-number relay
   host1(config-l2tp-tunnel-switch-profile)#avp cisco-nas-port relay
   ```

3. (Optional) Use the **show l2tp switch-profile** command to verify configuration of the tunnel switch profile.

```
host1(config-l2tp-tunnel-switch-profile)#run show l2tp switch-profile
L2TP tunnel switch profile concord
L2TP tunnel switch profile myProfile
2 L2TP tunnel switch profiles found

host1(config-l2tp-tunnel-switch-profile)#run show l2tp switch-profile concord
L2TP tunnel switch profile concord
  AVP bearer type action is relay
  AVP calling number action is relay
  AVP Cisco nas port info action is relay
```

Applying L2TP Tunnel Switch Profiles by Using AAA Domain Maps

To apply an L2TP tunnel switch profile to sessions associated with an AAA domain map:

1. Access Domain Map Tunnel Configuration mode.

   host1(config)#**aaa domain-map westford.com**
   host1(config-domain-map)#**router-name default**
   host1(config-domain-map)#**tunnel 3**
   host1(config-domain-map-tunnel)#

   For more information about how to map a domain to an L2TP tunnel from Domain Map Tunnel Configuration mode, see *Mapping a User Domain Name to an L2TP Tunnel Overview* in *Chapter 12, Configuring an L2TP LAC.*

2. From Domain Map Tunnel Configuration mode, issue the **switch-profile** command to apply the specified L2TP switch profile to the sessions associated with this domain map.

   host1(config-domain-map-tunnel)#**switch-profile concord**

3. (Optional) Use the **show aaa domain-map** command to verify application of the tunnel switch profile.

```
host1(config-domain-map-tunnel)#run show aaa domain-map

Domain: westford.com; router-name: default; ipv6-router-name: default
                                                                  Tunnel
Tunnel   Tunnel   Tunnel   Tunnel   Tunnel    Tunnel    Tunnel   Client
 Tag      Peer    Source    Type    Medium   Password     Id      Name
------   ------   ------   ------   ------   --------   ------   ------
3        <null>   <null>   l2tp     ipv4     <null>     <null>   <null>

         Tunnel                Tunnel                     Tunnel    Tunnel
Tunnel   Server     Tunnel       Max                      Virtual   Switch
 Tag      Name    Preference   Sessions     Tunnel RWS     Router    Profile
------   ------   ----------   --------   --------------   -------   -------
3        <null>   2000         0          system chooses   <null>    concord
```

Applying L2TP Tunnel Switch Profiles by Using AAA Tunnel Groups

To apply an L2TP tunnel switch profile to sessions associated with an AAA tunnel group:

1. Access Tunnel Group Tunnel Configuration mode.

   ```
   host1(config)#aaa tunnel-group sunnyvale
   host1(config-tunnel-group)#tunnel 3
   host1(config-tunnel-group-tunnel)#
   ```

   For more information about how to map a domain to an L2TP tunnel from Tunnel Group Tunnel Configuration mode, see *Mapping a User Domain Name to an L2TP Tunnel Overview* in *Chapter 12, Configuring an L2TP LAC*.

2. From Tunnel Group Tunnel Configuration mode, issue the **switch-profile** command to apply the specified L2TP switch profile to the sessions associated with this tunnel group.

   ```
   host1(config-tunnel-group-tunnel)#switch-profile sanjose
   ```

3. (Optional) Use the **show aaa tunnel-group** command to verify application of the tunnel switch profile.

   ```
   host1(config-tunnel-group-tunnel)#run show aaa tunnel-group

   Tunnel Group: sunnyvale
                                                                    Tunnel
   Tunnel   Tunnel   Tunnel   Tunnel   Tunnel    Tunnel    Tunnel   Client
    Tag      Peer    Source    Type    Medium   Password     Id      Name
   ------   ------   ------   ------   ------   --------   ------   ------
   3        <null>   <null>   l2tp     ipv4     <null>     <null>   <null>
            Tunnel                 Tunnel                      Tunnel    Tunnel
   Tunnel   Server     Tunnel       Max                        Virtual   Switch
    Tag      Name    Preference   Sessions     Tunnel RWS      Router    Profile
   ------   ------   ----------   --------   --------------   -------   -------
   3        <null>   2000         0          system chooses   <null>    sanjose
   ```

Applying Default L2TP Tunnel Switch Profiles

You can apply a default L2TP tunnel switch profile to a virtual router by issuing the **aaa tunnel switch-profile** command from Global Configuration mode. The router uses the default tunnel switch profile if the tunnel attributes returned from an AAA domain map or tunnel group or from a RADIUS authentication server *do not include* a named tunnel switch profile. The router ignores the default tunnel switch profile if the tunnel attributes returned from an AAA domain map or tunnel group or from a RADIUS authentication server *do include* a named tunnel switch profile.

The default L2TP tunnel switch profile applies to a specific virtual router. You can apply a different default tunnel switch profile to each virtual router configured.

To apply a default L2TP tunnel switch profile to a virtual router:

1. Create the virtual router to which you want to apply the default tunnel switch profile.

   ```
   host1(config)#virtual-router east
   host1:east(config)#
   ```

2. Issue the **aaa tunnel switch-profile** command to apply the default L2TP tunnel switch profile in the context of this virtual router.

   ```
   host1:east(config)#aaa tunnel switch-profile boston
   ```

3. (Optional) Use the **show aaa tunnel-parameters** command to verify application of the default tunnel switch profile.

   ```
   host1:east(config)#run show aaa tunnel-parameters
   Tunnel password is <NULL>
   Tunnel client-name is <NULL>
   Tunnel nas-port-method is none
   Tunnel switch-profile is boston
   Tunnel nas-port ignore disabled
   Tunnel nas-port-type ignore disabled
   Tunnel assignmentId format is assignmentId
   Tunnel calling number format is descriptive
   ```

Applying L2TP Tunnel Switch Profiles by Using RADIUS

On the LAC, the router can receive tunnel configuration attributes through a RADIUS authentication server. To use RADIUS to apply an L2TP tunnel switch profile to a session, you can configure RADIUS to include the Tunnel-Switch-Profile RADIUS attribute (VSA 26-91) in RADIUS Access-Accept messages.

For more information about RADIUS Access-Accept messages, see *Chapter 3, Configuring RADIUS Attributes*. For more information about the Tunnel-Switch-Profile attribute, see *Chapter 6, RADIUS Attribute Descriptions*.

Related Topics

- Enabling Tunnel Switching on the Router on page 332
- Configuring L2TP Tunnel Switch Profiles on page 332
- Applying L2TP Tunnel Switch Profiles by Using AAA Domain Maps on page 333
- Applying L2TP Tunnel Switch Profiles by Using AAA Tunnel Groups on page 334
- Applying Default L2TP Tunnel Switch Profiles on page 334
- Applying L2TP Tunnel Switch Profiles by Using RADIUS on page 335
- **aaa tunnel switch-profile** command

- **avp** command
- **l2tp switch-profile** command
- **l2tp tunnel-switching** command

Configuring the Transmit Connect Speed Calculation Method

You can configure the method that the router uses to calculate the transmit connect speed of the subscriber's access interface for a tunneled L2TP session. L2TP reports the transmit connect speed in L2TP Transmit (TX) Speed AVP 24. During the establishment of an L2TP tunnel session, the LAC sends AVP 24 to the LNS to convey the transmit speed of the subscriber's access interface.

You can configure the calculation method for the transmit connect speed reported in L2TP Transmit (TX) Speed AVP 24 in any of the following ways. The first three methods—AAA domain maps, AAA tunnel groups, and RADIUS—are mutually exclusive.

- AAA domain maps—Use the **tx-connect-speed-method** command from Domain Map Tunnel Configuration mode. For instructions, see *Using AAA Domain Maps to Configure the Transmit Connect Speed Calculation Method* on page 340.
- AAA tunnel groups—Use the **tx-connect-speed-method** command from Tunnel Group Tunnel Configuration mode. For instructions, see *Using AAA Tunnel Groups to Configure the Transmit Connect Speed Calculation Method* on page 341.
- AAA default tunnel parameters—Use the **aaa tunnel tx-connect-speed-method** command from Global Configuration mode. The router uses the calculation method specified with this command if the tunnel attributes returned from an AAA domain map, an AAA tunnel group, or a RADIUS authentication server do not include the transmit connect speed calculation method.For instructions, see *Using AAA Default Tunnel Parameters to Configure the Transmit Connect Speed Calculation Method* on page 342.
- RADIUS—Include the Tunnel-Tx-Speed-Method RADIUS attribute (Juniper Networks VSA 26-94) in RADIUS Access-Accept messages. For instructions, see *Using AAA Default Tunnel Parameters to Configure the Transmit Connect Speed Calculation Method* on page 342.

Transmit Connect Speed Calculation Methods

In previous releases, the router calculated the transmit speed of the subscriber's access interface based only on statically configured settings for the underlying layer 2 access interface. With this feature, you can obtain a more accurate representation of the transmit connect speed by choosing a calculation method that reflects changes to the layer 2 interface due to statically configured settings, dynamically configured settings, or QoS settings.

You can choose one of the following methods for calculating the transmit connect speed that is reported in L2TP Transmit (TX) Speed AVP 24:

- Static layer 2
- Dynamic layer 2
- QoS
- Actual (lesser of dynamic layer 2 or QoS)

The following sections describe each of these calculation methods.

NOTE: Configuring the transmit connect speed calculation method has no effect on the operation of the L2TP Receive (RX) Speed AVP 38 or the Connect-Info RADIUS attribute [77] at the LAC.

Static Layer 2

The static layer 2 method calculates the transmit connect speed of the subscriber's access interface based on the statically configured settings for the underlying layer 2 ATM 1483 or Ethernet interface. The static layer 2 method does not reflect changes to the transmit speed of the layer 2 interface due to dynamically configured settings or to QoS.

For ATM 1483 circuits, the static layer 2 value is based on the bandwidth that the connection requires. The router uses certain traffic parameters for each service category to determine the required bandwidth for the connection. For more information about how the router computes bandwidth for ATM 1483 circuits, see *Connection Admission Control* in *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM*.

For Ethernet VLANs, the static layer 2 value is the advisory transmit speed of the VLAN subinterface, if configured with the **vlan advisory-tx-speed** command, or the speed of the underlying physical port if the advisory transmit speed is not configured.

If there is no explicit static configuration for the layer 2 interface, L2TP reports the speed of the underlying physical port as the transmit connect speed.

Dynamic Layer 2

The dynamic layer 2 method calculates the transmit connect speed of the subscriber's access interface based on the dynamically configured settings for the underlying layer 2 interface.

If there is no dynamic configuration for the layer 2 interface, L2TP reports the transmit connect speed based on statically configured settings. If there is no static speed configuration for the layer 2 interface, L2TP reports the speed of the underlying physical port as the transmit connect speed.

QoS

The QoS method calculates the transmit connect speed of the subscriber's access interface based on settings determined by static or dynamic QoS configurations. This calculation is based on the interface columns that QoS uses to build scheduler profiles for L2TP sessions. For example, a typical interface column might consist of an L2TP session over an Ethernet VLAN over a Gigabit Ethernet interface.

You can configure QoS to control the rate of any logical interface in the interface column. For those logical interfaces with a rate controlled by QoS, QoS reports this configured rate as the transmit connect speed for that interface. For those logical interfaces that do not have a QoS-configured rate, QoS reports the speed of the underlying physical port as the transmit connect speed.

For more information, see *QoS and L2TP TX Speed AVP 24 Overview* in *JUNOSe Quality of Service Configuration Guide, Chapter 22, Configuring QoS for L2TP Sessions*.

Actual

The actual method calculates the transmit connect speed of the subscriber's access interface as the lesser of the following two values:

- Value using the dynamic layer 2 calculation method
- Value using the QoS calculation method

Transmit Connect Speed Calculation Examples

The examples in this section illustrate how the router uses the methods described in *Transmit Connect Speed Calculation Methods* on page 336 to calculate the transmit connect speed.

Example 1: L2TP Session over ATM 1483 Interface

In this example, an L2TP session is established over an ATM 1483 subinterface on an OC3/STM1 ATM IOA. The configuration has the following characteristics:

- There is no explicit static configuration for the layer 2 (ATM 1483) interface.
- A transmit connect speed of 10 Mbps is provided dynamically from a RADIUS authentication server when the subscriber logs in.
- The transmit connect speed calculated by QoS is 5 Mbps.

Based on these characteristics, Table 67 lists the transmit connect speed value reported in L2TP Transmit (TX) Speed AVP 24 for each calculation method, and the reason why L2TP reports this value.

Table 67: Transmit Connect Speeds for L2TP over ATM 1483 Example

Calculation Method	Transmit Connect Speed Reported in AVP 24	Reason
Static layer 2	155 Mbps	L2TP reports the speed of the underlying OC3 physical port because there is no explicit static configuration for the layer 2 interface.
Dynamic layer 2	10 Mbps	L2TP reports the transmit connect speed provided by RADIUS.
QoS	5 Mbps	L2TP reports the transmit connect speed calculated by QoS.
Actual	5 Mbps	L2TP reports the lesser of the dynamic layer 2 speed (10 Mbps) or the QoS speed (5 Mbps).

Example 2: L2TP Session over Ethernet VLAN Interface

In this example, an L2TP session is established over a PPPoE subinterface over an Ethernet VLAN subinterface. The configuration has the following characteristics:

- The Ethernet VLAN subinterface is configured with an advisory transmit speed of 100 Mbps.
- The dynamic layer 2 setting does not apply to the VLAN subinterface.
- The transmit connect speed calculated by QoS is 10 Mbps.

Based on these characteristics, Table 68 lists the transmit connect speed value reported in L2TP Transmit (TX) Speed AVP 24 for each calculation method, and the reason why L2TP reports this value.

Table 68: Transmit Connect Speeds for L2TP over Ethernet Example

Calculation Method	Transmit Connect Speed Reported in AVP 24	Reason
Static layer 2	100 Mbps	L2TP reports the advisory transmit speed configured on the VLAN subinterface. If configured, the advisory transmit speed takes precedence over the physical port speed for a VLAN subinterface.
Dynamic layer 2	100 Mbps	L2TP reports the static layer 2 value because the dynamic layer 2 setting does not apply to a VLAN subinterface.
QoS	10 Mbps	L2TP reports the transmit connect speed calculated by QoS.
Actual	10 Mbps	L2TP reports the lesser of the dynamic layer 2 speed (100 Mbps) or the QoS speed (10 Mbps).

Transmit Connect Speed Reporting Considerations

The following considerations affect the transmit connect speed value reported in L2TP Transmit (TX) Speed AVP 24 when you use this feature.

Session Termination for Dynamic Speed Timeout

Under certain heavy load conditions, the router might be unable to obtain the dynamic-layer2 value for the transmit connect speed of the subscriber's access interface. In this situation, the LAC sends the LNS an L2TP Call-Disconnect-Notify (CDN) message to terminate the L2TP session.

For more information about supported L2TP terminate reasons, see *Chapter 7, Application Terminate Reasons*.

Advisory Speed Precedence for VLANs over Bridged Ethernet

For interface columns that consist of an L2TP session over an Ethernet VLAN subinterface over a bridged Ethernet interface, the advisory transmit speed of the VLAN subinterface, if configured with the **vlan advisory-tx-speed** command, takes precedence over the physical port speed of the underlying layer 2 ATM 1483 interface. As a result, if the advisory transmit speed is configured for the VLAN subinterface, L2TP reports this value as the transmit connect speed regardless of the port speed of the ATM 1483 interface.

Using AAA Domain Maps to Configure the Transmit Connect Speed Calculation Method

To configure the transmit connect speed calculation method for a tunneled L2TP session associated with an AAA domain map:

1. Access Domain Map Tunnel Configuration mode.

   ```
   host1(config)#aaa domain-map sunnyvale.com
   host1(config-domain-map)#router-name lac
   host1(config-domain-map)#tunnel 5
   host1(config-domain-map-tunnel)#
   ```

   For more information about how to map a domain to an L2TP tunnel from Domain Map Tunnel Configuration mode, see *Mapping a User Domain Name to an L2TP Tunnel Overview* in *Chapter 12, Configuring an L2TP LAC.*

2. From Domain Map Tunnel Configuration mode, configure the calculation method for the transmit connect speed of the subscriber's access interface.

   ```
   host1(config-domain-map-tunnel)#tx-connect-speed-method dynamic-layer2
   ```

3. (Optional) Use the **show aaa domain-map** command to verify configuration of the transmit connect speed calculation method.

   ```
   host1(config-domain-map-tunnel)#run show aaa domain-map

   Domain: sunnyvale.com; router-name: lac; ipv6-router-name: default
                                                                    Tunnel
   Tunnel   Tunnel   Tunnel   Tunnel   Tunnel    Tunnel    Tunnel   Client
    Tag      Peer    Source    Type    Medium   Password     Id      Name
   ------   ------   ------   ------   ------   --------   ------   ------
   5        <null>   <null>   l2tp     ipv4     <null>     <null>   <null>
   ```

```
        Tunnel                Tunnel                    Tunnel
Tunnel  Server     Tunnel      Max                       Virtual
 Tag     Name    Preference  Sessions     Tunnel RWS     Router
------  ------  ----------  --------  --------------  -------
5       <null>  2000        0         system chooses  <null>
         Tunnel   Tunnel       Tunnel
Tunnel  Failover  Switch         Tx
 Tag     Resync   Profile    Speed Method
------  --------  -------  --------------
5       <null>    <null>   dynamic layer2
```

Using AAA Tunnel Groups to Configure the Transmit Connect Speed Calculation Method

To configure the transmit connect speed calculation method for a tunneled L2TP session associated with an AAA tunnel group:

1. Access Tunnel Group Tunnel Configuration mode.

   ```
   host1(config)#aaa tunnel-group boston
   host1(config-tunnel-group)#tunnel 3
   host1(config-tunnel-group-tunnel)#
   ```

   For more information about how to map a domain to an L2TP tunnel from Tunnel Group Tunnel Configuration mode, see *Mapping a User Domain Name to an L2TP Tunnel Overview* in *Chapter 12, Configuring an L2TP LAC*.

2. From Tunnel Group Tunnel Configuration mode, configure the calculation method for the transmit connect speed of the subscriber's access interface.

   ```
   host1(config-tunnel-group-tunnel)#tx-connect-speed-method qos
   ```

3. (Optional) Use the **show aaa tunnel-group** command to verify configuration of the transmit connect speed calculation method.

   ```
   host1(config-tunnel-group-tunnel)#run show aaa tunnel-group

   Tunnel Group: boston
                                                                    Tunnel
   Tunnel   Tunnel   Tunnel   Tunnel   Tunnel    Tunnel    Tunnel   Client
    Tag      Peer    Source    Type    Medium   Password     Id      Name
   ------   ------   ------   ------   ------   --------   ------   ------
   3        <null>   <null>   l2tp     ipv4     <null>     <null>   <null>
           Tunnel                Tunnel                      Tunnel
   Tunnel  Server     Tunnel      Max                       Virtual
    Tag     Name    Preference  Sessions     Tunnel RWS     Router
   ------  ------  ----------  --------  --------------  -------
   3       <null>  2000        0         system chooses  <null>
                               Tunnel
            Tunnel    Tunnel     Tx
   Tunnel  Failover  Switch    Speed
    Tag     Resync   Profile   Method
   ------  --------  -------  ------
   3       <null>    <null>   qos
   ```

Using AAA Default Tunnel Parameters to Configure the Transmit Connect Speed Calculation Method

You can configure the transmit connect speed calculation method as a default AAA tunnel parameter by using the **aaa tunnel tx-connect-speed-method** command from Global Configuration mode. This command applies the specified calculation method to all tunneled L2TP sessions associated with a particular virtual router, and thereby alleviates the need for you to configure the transmit connect speed calculation method for each individual subscriber.

Configuring the calculation method as a default AAA tunnel parameter for a virtual router has lower precedence than using AAA domain maps, AAA tunnel groups, or RADIUS to configure the transmit connect speed calculation method. The router uses the calculation method specified with the **aaa tunnel tx-connect-speed-method** command if the tunnel attributes returned from an AAA domain map, an AAA tunnel group, or a RADIUS authentication server do not include the transmit connect speed calculation method.

To configure the transmit connect speed calculation method for all tunneled L2TP sessions associated with a particular virtual router:

1. Create the virtual router for which you want to configure the transmit connect speed calculation method.

   host1(config)#**virtual-router north**

   For more information about configuring and using virtual routers, see *JUNOSe System Basics Configuration Guide, Chapter 13, Configuring Virtual Routers*.

2. Configure the transmit connect speed calculation method in the context of this virtual router.

   host1:north(config)#**aaa tunnel tx-connect-speed-method qos**

   - To specify the calculation method for the transmit connect speed, use one of the following keywords, as described in *Using AAA Tunnel Groups to Configure the Transmit Connect Speed Calculation Method* on page 341:
     - **static-layer2**
     - **dynamic-layer2**
     - **qos**
     - **actual**

3. (Optional) Use the **show aaa tunnel-parameters** command to verify configuration of the transmit connect speed calculation method.

```
host1:north(config)#run show aaa tunnel-parameters
Tunnel password is <NULL>
Tunnel client-name is <NULL>
Tunnel nas-port-method is none
Tunnel switch-profile is boston
Tunnel tx-connect-speed-method is qos
```

```
Tunnel nas-port ignore disabled
Tunnel nas-port-type ignore disabled
Tunnel assignmentId format is assignmentId
Tunnel calling number format is fixed
```

Using RADIUS to Configure the Transmit Connect Speed Calculation Method

On the LAC, the router can receive tunnel configuration attributes through a RADIUS authentication server. To use RADIUS to configure the transmit connect speed calculation method for a subscriber's access interface, you can configure RADIUS to include the Tunnel-Tx-Speed-Method RADIUS attribute (Juniper Networks VSA 26-94) in RADIUS Access-Accept messages.

Table 69 describes the Tunnel-Tx-Speed-Method RADIUS attribute. For more information about RADIUS Access-Accept messages, see *Chapter 3, Configuring RADIUS Attributes*. For a description of the RADIUS attributes supported by JUNOSe software, see *Chapter 6, RADIUS Attribute Descriptions*.

Table 69: Tunnel–Tx-Speed-Method RADIUS Attribute

Attribute Number	Attribute Name	Description	Length	Subtype Length	Value
[26-94]	Tunnel-Tx-Speed-Method	The method that the router uses to calculate the transmit connect speed of the subscriber's access interface	12	6	integer: ■ 1 = static-layer2; TX speed based on static layer 2 settings ■ 2 = dynamic-layer2; TX speed based on dynamic layer 2 settings ■ 3 = qos; TX speed based on QoS settings ■ 4 = actual; TX speed that is the lesser of the dynamic-layer2 value or the qos value

Related Topics

- Transmit Connect Speed Calculation Methods on page 336
- Using AAA Domain Maps to Configure the Transmit Connect Speed Calculation Method on page 340
- Using AAA Tunnel Groups to Configure the Transmit Connect Speed Calculation Method on page 341
- Using AAA Default Tunnel Parameters to Configure the Transmit Connect Speed Calculation Method on page 342
- Using RADIUS to Configure the Transmit Connect Speed Calculation Method on page 343
- **aaa tunnel tx-connect-speed-method** command
- **tx-connect-speed-method** command

PPP Accounting Statistics

JUNOSe accounting for tunneled subscribers at the L2TP LAC counts the payload that PPP passes to or receives from L2TP for transport. At this stage in the protocol processing, any padding outside PPP, such as that for PPPoE, has been removed. Accounting includes the authentication acknowledgement packet, CHAP success packets, and PAP acknowledgment packets. Accounting ends when L2TP has been notified to terminate the session. The statistics are reported in the following RADIUS attributes:

Attribute Number	Attribute Name
42	Acct-Input-Octets
43	Acct-Output-Octets
47	Acct-Input-Packets
48	Acct-Output-Packets

Termination of a tunneled session can result from PPP termination, L2TP shutdown, subscriber logout, or lower layer down events. When the session is terminated through PPP, the software counts both the PPP terminate-request and the PPP terminate-acknowledgement packets.

- Accounting statistics reported in RADIUS octet counts (Acct-Input-Octets and Acct-Output-Octets) for tunneled PPP customers at the L2TP LAC include the following data:
  - All upper layer control traffic, including IPCP, IPCPv6, OSICP, and MPLSNCP
  - All data traffic, including IP, IPv6, MPLS, and OSI
  - PPP PAP or CHAP acknowledgments. and also retransmission of PAP or CHAP that take place after the session is active (even when proxy authentication is accepted)
  - All PPP PAP or CHAP negotiations in the case where proxy authentication is disabled or required to renegotiate at the LNS
  - All LCP traffic when proxy LCP is disabled or required to renegotiate at the LNS
  - All PPP LCP echo requests and their responses
  - PPP LCP terminate-request or terminate-acknowledgement packets from the client or LNS when PPP initiates termination of the session
  - If present, the two PPP header bytes (Address Field 0xFF and Control Field 0x03) as part of the L2TP payload

- Accounting statistics reported in RADIUS octet counts (Acct-Input-Octets and Acct-Output-Octets) for tunneled PPP customers at the L2TP LAC exclude the following data:
  - LCP when Proxy LCP is enabled and accepted at the LNS
  - Initial PPP PAP request
  - Initial PPP CHAP challenge and response
- Accounting statistics reported in RADIUS packet counts (Acct-Input-Packets and Acct-Output-Packets) for tunneled PPP customers at the L2TP LAC are based on packets delivered to or received from the L2TP session. These statistics exclude L2TP control traffic and L2TP hello messages.

For information on accounting statistics for terminated PPP sessions, see *PPP Accounting Statistics* in *JUNOSe Link Layer Configuration Guide, Chapter 7, Configuring Point-to-Point Protocol*.

Chapter 14

Configuring L2TP Dial-Out

This chapter describes the Layer 2 Tunneling Protocol (L2TP) dial-out feature on your E-series router. This chapter includes the following sections:

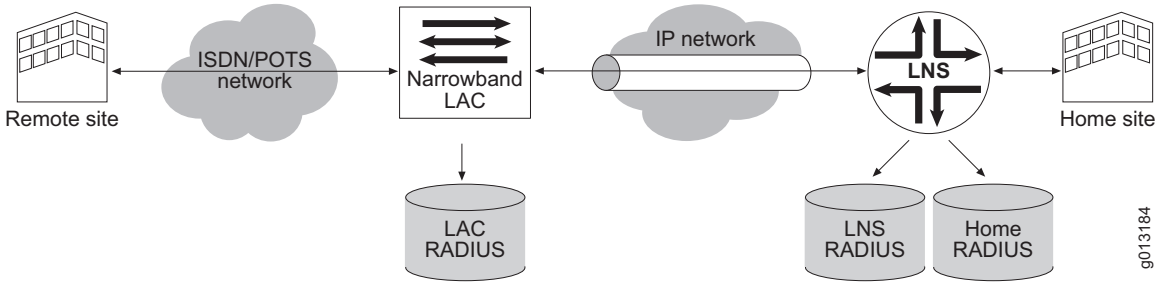
Overview

L2TP dial-out provides a way for corporate virtual private networks (VPNs) that use Broadband Remote Access Server (B-RAS) to dial out to remote offices that have only narrowband dial-up access. The L2TP network server (LNS) function is deployed in networks that have a combination of broadband and narrowband access.

A remote site can communicate on demand with the home site with a normal L2TP access concentrator (LAC) to LNS session. When the communication finishes, the remote site terminates the session. However, if the home site wishes to communicate with the remote site and no incoming call is currently established, the home site needs a method to dial out to the remote site. This method is L2TP dial-out, which uses the L2TP outgoing call support defined in RFC 2661—Layer Two Tunneling Protocol “L2TP” (August 1999).

Figure 10 shows the dial-out model in which the LNS initiates L2TP sessions and provides enough information to the narrowband LAC so that it can complete the dial-out from the home site to the remote site.

Figure 10: Network Model for Dial-Out



NOTE: The dial-out feature exists in the LNS only. It does not exist in the LAC.

Terms

Table 70 describes key terms used in L2TP dial-out.

Table 70: L2TP Dial-Out Terms

Term	Description
Dial-out trigger	IP packet that initiates a dial-out session
Dial-out session	Control entity for a triggered IP flow used to manage the establishment of an associated L2TP session for dial-out
Dial-out target	A virtual router context and an IP address prefix, for which the arrival of an IP packet (a dial-out trigger) initiates a dial-out session.
Dial-out route	Contains the dial-out target, as well as a domain name and profile. ■ The domain name is used in the initial Access-Request message. ■ The profile is used to create the IP/Point-to-Point Protocol (PPP) stack for the dial-out session.

Network Model for Dial-Out

In Figure 10, the home site connects to the Internet over a permanent leased line to the Internet service provider's (ISP's) E-series LNS. The ISP uses an IP network to connect the LNS to the narrowband access point of the network where the narrowband LAC exists. The narrowband LAC connects to a narrowband network (ISDN) that the remote site is also connected to.

The figure shows three RADIUS servers. The home site maintains the home server, and the other two servers are at the LNS and the LAC. The router accesses the home and LNS RADIUS servers. (The separation of the RADIUS servers is transparent to the router.)

Before any attempts at connectivity can take place from the home site to the remote site, an administrator must configure a dial-out route on the router. This route directs the router to start a dial-out operation. The route includes a dial-out target (the virtual router context and the IP address of the remote site). When the router receives a packet destined for the target, it triggers a dial-out session to the target. The route is associated with a profile that holds parameters for the interface stack that the router builds as a result of the dial-out.

Dial-Out Process

The following is the dial-out process used in the Figure 10 network:

1. The router receives a trigger packet.

2. The router builds a RADIUS Access-Request message and sends it to the RADIUS server that is associated with the virtual router on which the dial-out route is defined—typically, the RADIUS home server.

3. The RADIUS server's response to the Access-Request is similar to the response used for LAC incoming calls. Notable differences are that the IP addresses of the peer are interpreted as LAC addresses instead of LNS addresses. In addition, narrowband details, such as calling numbers, are returned.

4. The LNS makes the outgoing call using a load-balancing or round-robin mechanism identical to the one that the E-series LAC uses for incoming calls. The LAC may also employ the LAC RADIUS in tunnel authentication.

5. Once the LNS successfully completes a control connection and session with the LAC, the LAC performs the actual narrowband dial-out operation to the remote site using the information passed by the LNS during session setup.

6. A PPP session is started on the remote customer premises equipment (CPE), and mutual PPP authentication is performed at the remote CPE and the LNS as follows:

    a. The LNS uses the LNS RADIUS server to validate the remote CPE's PPP session, while the CPE can use its own RADIUS server to validate the LNS's PPP session.

    b. The LNS uses the username and password that is returned in the first Access-Accept message.

7. Once authentication is successful, an IP interface is built on top of the PPP interface at the LNS. Internet Protocol Control Protocol (IPCP) is negotiated, and the framed route that RADIUS returns as a result of the PPP authentication supersedes the dial-out route.

IP traffic can now flow freely between the home and remote sites.

Dial-Out Operational States

The dial-out state machine is a control process within the router that manages the dial-out function for each IP flow. The dial-out state machine has four levels of control: the router chassis, virtual router, targets, and sessions. This section describes the operational states of each of these levels.

Chassis

Table 71 describes the operational states of the chassis.

Table 71: Chassis Operational States

State	Description
inService	Dial-out service is operational at the chassis level.
initializationFailed	Dial-out service could not obtain enough system resources for basic operation. All configuration commands fail, and the dial-out service does not function.

Virtual Router

Table 72 describes the operational states of the virtual router.

Table 72: Virtual Router Operational States

State	Description
inService	Dial-out service is operational for the virtual router.
initPending	Dial-out service is waiting for the virtual router to be operational. Targets defined within the virtual router are not functional.
down	The dial-out interface for this virtual router is down. Targets defined within the virtual router are not functional.

Targets

Table 73 describes the operational states of the targets.

Table 73: Target Operational States

State	Description
inService	Dial-out route is up and operational.
inhibited	Dial-out service cannot obtain sufficient resources to handle triggers, and all triggers are discarded. When resources become available, a target can transition from inhibited to inService. Note that sessions within an inhibited target that are already in the process of connecting or are in the inService state are not affected by this condition.
down	There are insufficient resources to support the creation of a dial-out route for the target. When resources become available, the target can transition to inService. Note that sessions within a down target that are already in the process of connecting or are in the inService state are not affected by this condition.

Sessions

Table 74 describes operational states of the sessions.

Table 74: Session Operational States

State	Description
authenticating	New sessions start in the authenticating state. In this state, the dial-out state machine has received a valid trigger and is waiting for authentication, authorization, and accounting (AAA) to complete the initial authentication. On getting a grant from AAA, the session transitions to the connecting state. Alternatively, on getting a deny from AAA, the session transitions to the inhibited state.
connecting	Sessions enter the connecting state when authentication is complete. In this state, the dial-out state machine has initiated an outgoing L2TP call. On entering this state, the session-connecting timer is set to the chassis-wide trigger timer value. The session stays in this state until either the outgoing call is successful or the connecting timer expires. Any new trigger packets received for this session when it is in the connecting state are discarded.
inService	A session enters the inService state from the connecting state on successful completion of the dial-out call request. The session stays in this state until the outgoing call is closed.
inhibited	A session enters the inhibited state from the connecting state when the connecting timer expires (that is, the outgoing call was unsuccessful). This state prevents the router from thrashing on an outgoing call that cannot be completed. When in this state, the router discards all trigger packets received for the session. The inhibited timer controls the amount of time spent in this state. The setting of the inhibited timer varies depending on whether the session is entering the inhibited state for the first time or is reentering the state. ■ If it is the first time, the inhibited timer is initialized to the chassis-wide trigger value. ■ If it is reentering the state, the inhibited timer is initialized to 2 times the previous value of the inhibited timer, up to a maximum of 8 times the chassis-wide trigger value. For example, if the chassis-wide trigger value is 30 seconds, the setting of the inhibited timer within the session (on subsequent immediate reentries; see postInhibited state) is 30, 60, 120, 240. Since 240 is 8 x 30, the inhibited timer for this session is never set larger than 240 seconds.
postInhibited	A session enters the postInhibited state after completion of an inhibited state. The inhibited timer is reused to control the amount of time the session stays in postInhibited state. In this state the timer repeatedly times out and reduces the inhibited timer by a factor of 2 on each iteration. Once the inhibited timer reaches zero, the session transitions to dormant. The receipt of a trigger in this state results in a transition to the authenticating state.
dormant	A session enters the dormant state after completion of a postInhibited state. The dormant timer is initialized to the chassis-wide dormant timer value, minus the time the session spent in the postInhibited state. Receipt of a new trigger packet transitions the session to the authenticating state. If the dormant timer expires, the session is deleted. The dormant state exists to allow analysis of a dial-out session before it is deleted.

Table 74: Session Operational States (continued)

State	Description
pending	A session enters the pending state when a valid trigger is received but there already are the maximum number of connecting sessions in the router. The router discards all subsequent trigger packets until other sessions transition out of the connecting state. When this happens, pending sessions can transition to the dormant state.
failed	A session enters the failed state when the router detects a configuration error that prevents the successful operation of the session. Specifically, one of the final steps in a dial-out request is mutual PPP authentication at the LNS. A side-effect of authentication is the installation of an access route for the outgoing call. If the access route does not correspond to the trigger packet (that is, the trigger packet cannot be routed successfully by the new access route), the router detects this discrepancy as a configuration error because trigger packets that arrive are not forwarded into the outgoing call; rather, they are buffered or discarded. The only way to exit the failed state is with the **l2tp dial-out session reset** command.

Outgoing Call Setup Details

This section details the process described in *Dial-Out Process* on page 349.

Access-Request Message

To create the username in the authentication request, the router uses the trigger, dial-out route, domain name, and optional Multiprotocol Label Switching (MPLS) route distinguisher (RD). The username is constructed as follows:

[MPLS RD]/{trigger destination address}@domain-name

For example, given a dial-out route with an IP prefix of 10.10.0.0/16, a domain name of L2TP-dial-out.de.dt, and an MPLS RD of 0.0.0.0:65000, if a trigger packet arrives with a destination IP address of 10.10.1.1, the router creates the following username:

0.0.0.0:65000/10.10.1.1@L2TP-dial-out.de.dt

No password is offered, and the authentication request is passed to the S-series AAA server for normal authentication processing.

Using the above example, the AAA domain map processes the L2TP-dial-out.de.dt domain as for any other domain. If RADIUS authentication is configured for the authenticating virtual router (VR) context, AAA passes the authentication request to the E-series RADIUS client. The RADIUS authentication request is consistent with other requests, except that the Service-Type attribute is set to outbound (value of 5).

Access-Accept Message

The router expects RADIUS attributes that define a tunnel to be returned with the additions in Table 75. If tunnel attributes are excluded from the Access-Accept message or the returned Service-Type attribute is not set to outbound, the dial-out session is denied.

Table 75: Additions to RADIUS Attributes in Access-Accept Messages

Attribute Number	Attribute Name	Content
6	Service-Type	Outbound
67	Tunnel-Server-Endpoint	IP address of LAC
Juniper VSA 26-35	Tunnel-Dialout-Number	L2TP dial-out number
Juniper VSA 26-36	PPP-Username	Username used in PPP L2TP dial-out sessions at the LNS
Juniper VSA 26-37	PPP-Password	Password used in PPP L2TP dial-out sessions at the LNS
Juniper VSA 26-38	PPP-Protocol	Authentication protocol used for L2TP sessions. 0 = none 1 = PAP 2 = CHAP 3 = PAP-CHAP 4 = CHAP-PAP
Juniper VSA 26-39	Tunnel-Min-Bps	Minimum line speed; passed to LAC (not interpreted by the LNS)
Juniper VSA 26-40	Tunnel-Max-Bps	Maximum line speed; passed to LAC (not interpreted by the LNS)
Juniper VSA 26-41	Tunnel-Bearer-Type	Bearer capability required: 0 = name; 1 = analog; 2 = digital. Passed to LAC (not interpreted by the LNS).

Outgoing Call

After receiving a valid tunnel definition from AAA, the E-series LNS initiates an outgoing call. The router follows the same load-sharing mechanisms as for incoming calls. See *Configuring LAC Tunnel Selection Parameters* in *Chapter 12, Configuring an L2TP LAC*.

After an outgoing call is successfully signaled, the router dynamically creates a PPP interface. The profile in the dial-out route definition specifies any PPP configuration options. Both the L2TP session and the PPP interface exist on a Tunnel Service module, identical to the LNS operation for incoming calls.

Once the PPP interface is created, Link Control Protocol (LCP) and IPCP are negotiated.

Mutual Authentication

Mutual authentication takes place in LCP, where the LNS validates the PPP interface on the remote CPE and vice-versa. LNS takes the same actions to authenticate the peer as it does on incoming calls.

The LNS obtains the PPP username and password from the initial Access-Accept message. It then provides this information to the remote CPE for authentication.

Route Installation

Once authentication is complete, the router creates a new access route. This route directs the forwarding of IP packets related to the original trigger packet to the newly created interface. The route does not need to be identical to the one specified in the dial-out route, but it must be able to forward packets that have the same destination address as the trigger packet. However, if the access route does not encompass the dial-out route definition, any other trigger packets initiate a new dial-out session.

The dial-out state machine verifies that the trigger packet can be forwarded over the route.

- If the verification is unsuccessful, the dial-out session is put into the failed state.
- If the verification is successful, the dial-out session is put into the inService state.

Platform Considerations

L2TP dial-out is supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about L2TP, see RFC 2661—Layer Two Tunneling Protocol "L2TP" (August 1999).

Before You Configure L2TP Dial-Out

Create a profile that the router uses to create the dynamic PPP and IP interfaces on the LNS. The profile specifies parameters that are common to all dial-out sessions that use the profile. The following is an example of a typical profile configuration.

1. Create a profile.

   host1(config)#**profile dialOut**
   host1(config-profile)#

2. Specify the interface used for dialout.

   host1(config-profile)#**ip unnumbered loopback 0/0**

3. Specify the virtual router for the dial-out user's IP interface.

   host1(config-profile)#**ip virtual-router lns**

4. Specify the authentication mechanism.

   host1(config-profile)#**ppp authentication chap**

Configuring L2TP Dial-Out

To configure L2TP dial-out:

1. Enable the creation of a dial-out session.

   host1(config)#**l2tp dial-out target 10.10.0.0 255.255.0.0 L2TP-dial-out.de.dt profile dialOut**

2. (Optional) Set the maximum time allowed for successful establishment of an L2TP dial-out session.

   host1(config)#**l2tp dial-out connecting-timer-value 30**

3. (Optional) Set how long the dial-out session stays in the dormant state waiting for a new trigger after the associated L2TP outgoing call ends.

   host1(config)#**l2tp dial-out dormant-timer-value 300**

4. (Optional) Set the maximum number of trigger packets held in buffer while the dial-out session is being established.

   host1(config)#**l2tp dial-out max-buffered-triggers 50**

You can also:

- Manually delete a dial-out session.

  host1#**l2tp dial-out session delete 10.10.0.0**

- Reset a dial-out session by forcing it to the dormant state.

  host1#**l2tp dial-out session reset 10.10.0.0**

l2tp dial-out connecting-timer-value

- Use to set the maximum time allowed for attempts to establish L2TP dial-out sessions.
- If the session fails to be established before the connecting timer expires, subsequent attempts to establish the dial-out session to the same destination are inhibited temporarily.
- The range is 30–3600 seconds.
- Example

  host1(config)#**l2tp dial-out connecting-timer-value 30**

- Use the **no** version to set the connecting timer to the default, 30 seconds.

l2tp dial-out dormant-timer-value

- Use to set how long the dial-out session waits in the dormant state for a new trigger after the associated L2TP outgoing call ends.
- If no trigger is received before the dormant timer expires, the dial-out session is deleted.
- The range is 0–3600 seconds.
- Example

  host1(config)#**l2tp dial-out dormant-timer-value 300**

- Use the **no** version to set the dormant timer to the default, 300 seconds (5 minutes).

l2tp dial-out max-buffered-triggers

- Use to set the maximum number of buffered trigger packets held for any dial-out session pending the successful establishment of the L2TP session. Once the session is established, the buffered trigger packets are transmitted.
- Trigger packets received when the maximum number of triggers are already buffered are discarded.
- The range of values is 0–50.
- Example

  host1(config)#**l2tp dial-out max-buffered-triggers 50**

- Use the **no** version to set the number of trigger buffers to the default, 0.

l2tp dial-out session delete

- Use to delete a dial-out session.
- Closes any L2TP outgoing call associated with the dial-out session.
- Example

  host1#**l2tp dial-out session delete 10.10.0.0**

- There is no **no** version.

l2tp dial-out session reset

- Use to force the dial-out session to the dormant state where it remains until the dormant timer expires or it receives a new trigger.
- Closes any L2TP outgoing call associated with the dial-out session.
- Example

  host1#**l2tp dial-out session reset 10.10.0.0**

- There is no **no** version.

l2tp dial-out target

- Use to define an L2TP dial-out target. When the router receives packets destined for the target, it creates a dial-out session.
- When you create a target, you must specify the following:
  - *ipAddress*—IP address of the target
  - *ipAddressMask*—IP address mask of the target
  - *domainName*—Domain name used in the outgoing call Access-Request message
  - *profileName*—Name of profile used to create the interface stack
- Example

  host1(config)#**l2tp dial-out target 10.10.0.0 255.255.0.0 L2TP-dial-out.de.dt profile dialOut**

- Use the **default** version to remove the L2TP dial-out route.
- Use the **no** version to remove the L2TP dial-out route or target.

Monitoring L2TP Dial-Out

To monitor L2TP dial-out, see:

- Monitoring Chassis-wide Configuration for L2TP Dial-out on page 382
- Monitoring Status of Dial-out Sessions on page 386
- Monitoring Dial-out Targets within the Current VR Context on page 387
- Monitoring Operational Status within the Current VR Context on page 388

Chapter 15

L2TP Disconnect Cause Codes

Table 76 describes the Point-to-Point Protocol (PPP) disconnect cause codes that are displayed by the **show l2tp received-disconnect-cause-summary** command, sorted by code number. For additional information, see RFC 3145.

Table 76: PPP Disconnect Cause Codes

Code	Name	Description
0	no info	Code 0 includes disconnect causes that are not specifically identified by other codes. This code is generated in the following circumstances: ■ Internal resource constraints (for example, excessive load or reduced resource availability) have prevented the generation of a more specific disconnect code. ■ RFC 3145 does not define a disconnect code that corresponds to the cause of the disconnection. The following list shows current disconnection causes on an E-series LNS that do not have a specific disconnect cause codes: ■ The peer initiated termination of LCP after the completion of LCP negotiations, but prior to proceeding to authentication of NCP negotiation. No conditions occurred that enabled the LNS to infer a more informative disconnect code. ■ The peer initiated renegotiation of LCP. ■ Invalid local MRU (for example, MRU negotiation has been disabled, but the lower MRU is less than the default MRU of 1500). ■ Unexpected local MLPPP MRRU for existing bundle (RFC 3145 code 10 covers peer MRRU mismatches, but not local mismatches). ■ Authentication failures not covered by any of the authentication-related codes (codes 13-16), such as: ■ Authentication denial of the local LCP by the peer ■ Local authentication failure due to no resources ■ Local authentication failure due to no authenticator
1	admin disconnect	The disconnection was a result of direct administrative action, including: ■ The administrator shut down the network or link interface. ■ The administrator logged out the subscriber.
2	renegotiation disabled	Code 2 is not used; the E-series LNS is always capable of renegotiating LCP if proxy data is not available.

Table 76: PPP Disconnect Cause Codes (continued)

Code	Name	Description
3	normal disconnect	Indicates that one of the following events occurred: ■ user-initiated logout (direction 1) ■ session timeout (direction 2) ■ inactivity timeout (direction 2) ■ address lease expired (direction 2) The E-series LNS determines by inference that a normal disconnect has occurred for direction 1. The LNS does this when the peer initiates LCP termination after proceeding beyond the successful negotiation of LCP (that is, after starting authentication signaling or NCP negotiation).
4	compulsory encryption refused	Code 4 with direction 2 is generated if the following conditions are met: ■ The peer initiates LCP termination without having proceeded beyond the completion of LCP negotiation, and ■ Prior to receiving the terminate request from the peer, the local LCP has sent a Protocol Reject in response to any packet for Encryption Control Protocol (ECP) protocols (protocol codes 0x8053, 0x8055) from the peer. Code 4 with direction 1 is never generated, because the E-series LNS never requests ECP.
5	lcp failed to converge	An LCP configuration error prevented LCP from converging; the two peers attempted to negotiate but did not agree on acceptable LCP parameters.
6	lcp peer silent	LCP negotiation timed out; the LNS did not receive any LCP packets from the LAC.
7	lcp magic number error	A magic number error was detected; this indicates a possible looped back link.
8	lcp keepalive error	The keepalive drop count was exceeded.
9	lcp mlppp endpoint discriminator mismatch	Code 9 is not used. Dynamic MLPPP bundling, which is the only kind of MLPPP bundling supported for MLPPP/L2TP, uses the endpoint discriminator as part of the key for bundle selection. Therefore, there will never be an unexpected endpoint discriminator for an existing MLPPP bundle.
10	lcp mlppp mrru not valid	The link attempted to join an existing MLPPP bundle whose peer maximum received reconstructed unit (MRRU) did not match the peer MRRU negotiated by the link.
11	lcp mlppp peer ssn invalid	Code 11 is not used; the short sequence number (SSN) option is not supported.
12	lcp callback refused	Code 12 with direction 2 is generated when the following conditions are met: ■ The peer initiates LCP termination without having proceeded to NCP negotiation, and ■ Prior to the termination, the local LCP has responded with a negative acknowledgement (NAK) to a callback option (LCP option 13) from the peer. The E-series LNS never generates code 12 with direction 1 because the LNS never requests callback.
13	authenticate timed out	Authentication failed because the authentication protocol timed out; either the CHAP Authenticate Response or the PAP Authenticate Request was not received.
14	authenticate mlppp name mismatch	Code 14 is not used. Dynamic MLPPP bundling, which is the only kind of MLPPP bundling supported for MLPPP/L2TP, uses the authenticated name as part of the key for bundle selection. Therefore, there will never be an unexpected authenticated name for an existing MLPPP bundle.

Table 76: PPP Disconnect Cause Codes (continued)

Code	Name	Description
15	authenticate protocol refused	No acceptable authentication protocol was negotiated by LCP. ■ Code 15 with direction 1 is generated if the peer rejected all of the authentication protocols requested by the local LCP. ■ Code 15 with direction 2 is generated if the following conditions are met: ■ The peer initiates LCP termination without having proceeded beyond completion of NCP negotiation, and ■ During LCP negotiation, the local LCP responded with a NAK to the final authentication protocol requested by the peer.
16	authenticate failure	■ Code 16 with direction 1 is generated if the local authentication of the peer fails (that is, the authenticator sent a PAP NAK or CHAP Failure packet) ■ Code 16 with direction 2 is generated if the peer authentication of the local LCP fails (that is, the authenticator received a PAP NAK or CHAP Failure packet). Note that there are a variety of causes for authentication failures, including bad credentials (bad name, password or secret) and resource problems.
17	ncp no negotiation completed	Code 17 is generated only if an NCP configuration error has prevented NCP negotiation from converging. This occurs when the two peers do not agree on acceptable NCP parameters within the time allowed for upper-layer negotiation. Code 19 takes precedence over code 17 in situations related to address convergence failure.
18	ncp no ncps available	No NCPs were successfully enabled within the time allowed for upper-layer negotiation.
19	ncp addresses failed to converge	An NCP configuration error has prevented NCP negotiation from converging on acceptable addresses. This occurs if the two peers never agree on acceptable NCP addresses within the time allowed for upper-layer negotiation. ■ Code 19 with direction 1 is generated if the peer denies address parameters requested by the local NCP. ■ Code 19 with direction 2 is generated if the local NCP denies address parameters requested by the peer. The IPv6 interface identifier is considered an address for the purposes of code 19. Code 19 takes precedence over code 17 in situations related to address convergence failure.
20	ncp negotiation inhibited	■ Code 20 with direction 2 indicates that an upper layer negotiation was inhibited for any enabled NCP because the required network-layer parameters were not available as a result of the authentication stage. ■ Code 20 with direction 1 is never generated; the NCPs are never enabled if there is no non-null local address.

Chapter 16
Monitoring L2TP and L2TP Dial-Out

When you have configured L2TP and L2TP dial-out on your E-series router, you can monitor the active tunnels and sessions.

NOTE: All of the commands in this chapter apply to both the LAC and the LNS.

L2TP and L2TP dial-out topics are described in the following sections:

Monitoring the Mapping for User Domains and Virtual Routers with AAA

Purpose Display the mapping between user domains and virtual routers.

Action To display the mapping between user domains and virtual routers:

```
host1#show aaa domain-map

Domain: lac-tunnel; router-name: lac; ipv6-router-name: default
Tunnel                 Tunnel   Tunnel   Tunnel    Tunnel
 Tag     Tunnel Peer   Source    Type    Medium   Password    Tunnel Id
------   -----------   ------   ------   ------   --------   -----------
5        192.168.1.1   <null>   l2tp     ipv4     welcome    lac-tunnel

                       Tunnel                Tunnel
Tunnel     Tunnel      Server     Tunnel      Max
 Tag     Client Name    Name    Preference   Sessions     Tunnel RWS
------   -----------   ------   ----------   --------   --------------
5        lac           boston   5            0          4

                                                 Tunnel
         Tunnel     Tunnel      Tunnel        Tx
Tunnel   Virtual   Failover     Switch      Speed
 Tag     Router     Resync     Profile      Method
------   -------   --------   ---------    ------
5        <null>    <null>      denver      qos
```

Meaning Table 77 lists the **show aaa domain-map** command output fields.

Table 77: show aaa domain-map Output Fields

Field Name	Field Description
Domain	Name of the domain
router-name	Virtual router to which user domain name is mapped
router-mask	IPv4 mask of the local interface
tunnel-group	Name of the tunnel group assigned to the domain map
ipv6-router-name	IPv6 virtual router to which user domain name is mapped
local-interface	Interface information to use on the local (E-series) side of the subscriber's interface
ipv6-local-interface	IPv6 interface information to use on the local (E-series) side of the subscriber's interface
poolname	Local address pool from which the router allocates addresses for this domain
IP hint	IP hint is enabled
strip-domain	Strip domain is enabled
override-username	Single username used for all users from a domain in place of the values received from the remote client
override-password	Single password used for all users from a domain in place of the values received from the remote client
Tunnel Tag	Tag that identifies the tunnel

Table 77: show aaa domain-map Output Fields (continued)

Field Name	Field Description
Tunnel Peer	Destination address of the tunnel
Tunnel Source	Source address of the tunnel
Tunnel Type	L2TP
Tunnel Medium	Type of medium for the tunnel; only IPv4 is supported
Tunnel Password	Password for the tunnel
Tunnel Id	ID of the tunnel
Tunnel Client Name	Host name that the LAC sends to the LNS when communicating to the LNS about the tunnel
Tunnel Server Name	Host name expected from the peer (the LNS) when during tunnel startup
Tunnel Preference	Preference level for the tunnel
Tunnel Max Sessions	Maximum number of sessions allowed on a tunnel
Tunnel RWS	L2TP receive window size (RWS) for a tunnel on the LAC; displays either the configured value or the default behavior, which is indicated by `system` chooses
Tunnel Virtual Router	Name of the virtual router to map to the user domain name
Tunnel Failover Resync	L2TP peer resynchronization method
Field descriptions	The actual fields displayed depend on your configuration
Tunnel Switch Profile	Name of the L2TP tunnel switch profile
Tunnel Tx Speed Method	Method that the router uses to calculate the transmit connect speed of the subscriber's access interface: static layer2, dynamic layer2, qos, actual, not set

Related Topics

- **show aaa domain-map** command

Monitoring Configured Tunnel Groups with AAA

Purpose Display the currently configured tunnel groups.

Action To display information about currently configured tunnel groups:

```
host1#show aaa tunnel-group

Tunnel Group: boston
Tunnel                 Tunnel   Tunnel   Tunnel    Tunnel
 Tag     Tunnel Peer   Source    Type    Medium   Password    Tunnel Id
------   -----------   ------   ------   ------   --------   -----------
3        192.168.1.1   <null>   l2tp     ipv4     msn        <null>
```

```
                                Tunnel                    Tunnel
Tunnel      Tunnel              Server      Tunnel         Max
 Tag      Client Name           Name     Preference     Sessions      Tunnel RWS
------   -----------           ------   ----------     --------    --------------
3        msn.del.com           <null>   2000           0           4

                                                                    Tunnel
           Tunnel      Tunnel       Tunnel                          Tx
Tunnel     Virtual    Failover      Switch                        Speed
 Tag       Router      Resync      Profile                       Method
------    -------    --------    ---------                      ------
3         <null>     <null>       sanjose                       qos
```

Meaning Table 78 lists the **show aaa tunnel-group** command output fields.

Table 78: show aaa tunnel-group Output Fields

Field Name	Field Description
Domain	Name of the domain
router-name	Virtual router to which user domain name is mapped
router-mask	IPv4 mask of the local interface
tunnel-group	Name of the tunnel group assigned to the domain map
ipv6-router-name	IPv6 virtual router to which user domain name is mapped
local-interface	Interface information to use on the local (E-series) side of the subscriber's interface
ipv6-local-interface	IPv6 interface information to use on the local (E-series) side of the subscriber's interface
poolname	Local address pool from which the router allocates addresses for this domain
IP hint	IP hint is enabled
strip-domain	Strip domain is enabled
override-username	Single username used for all users from a domain in place of the values received from the remote client
override-password	Single password used for all users from a domain in place of the values received from the remote client
Tunnel Tag	Tag that identifies the tunnel
Tunnel Peer	Destination address of the tunnel
Tunnel Source	Source address of the tunnel
Tunnel Type	L2TP
Tunnel Medium	Type of medium for the tunnel; only IPv4 is supported
Tunnel Password	Password for the tunnel
Tunnel Id	ID of the tunnel
Tunnel Client Name	Host name that the LAC sends to the LNS when communicating to the LNS about the tunnel
Tunnel Server Name	Host name expected from the peer (the LNS) when during tunnel startup

Table 78: show aaa tunnel-group Output Fields (continued)

Field Name	Field Description
Tunnel Preference	Preference level for the tunnel
Tunnel Max Sessions	Maximum number of sessions allowed on a tunnel
Tunnel RWS	L2TP receive window size (RWS) for a tunnel on the LAC; displays either the configured value or the default behavior, which is indicated by `system` chooses
Tunnel Virtual Router	Name of the virtual router to map to the user domain name
Tunnel Failover Resync	L2TP peer resynchronization method
Field descriptions	The actual fields displayed depend on your configuration
Tunnel Switch Profile	Name of the L2TP tunnel switch profile
Tunnel Tx Speed Method	Method that the router uses to calculate the transmit connect speed of the subscriber's access interface: static layer2, dynamic layer2, qos, actual, not set

Related Topics

- **show aaa tunnel-group** command
- The information displayed is almost identical to the tunnel information displayed using the **show aaa domain-map** command. See *Monitoring the Mapping for User Domains and Virtual Routers with AAA* on page 364.

Monitoring Configuration of Tunnel Parameters with AAA

Purpose Display configuration of tunnel parameters used for tunnel definitions.

Action To display the configuration of tunnel parameters used for tunnel definitions:

```
host1#show aaa tunnel-parameters
Tunnel password is 3&92k%b#q4
Tunnel client-name is <NULL>
Tunnel nas-port-method is none
Tunnel switch profile is boston
Tunnel tx-connect-speed-method is qos
Tunnel nas-port ignore disabled
Tunnel nas-port-type ignore disabled
Tunnel assignmentId format is assignmentId
Tunnel calling number format is descriptive
Tunnel calling number format fallback is fixed
```

Meaning Table 79 lists the **show aaa tunnel-parameters** command output fields.

Table 79: show aaa tunnel-parameters Output Fields

Field Name	Field Description
Tunnel password	Default tunnel password
Tunnel client-name	Hostname that the LAC sends to the LNS when communicating about the tunnel
Tunnel nas-port-method	Default NAS port type
Tunnel switch profile is	Name of the default L2TP tunnel switch profile
Tunnel tx-connect-speed-method is	Method that the router uses to calculate the transmit connect speed of the subscriber's access interface: static layer2, dynamic layer2, qos, actual, not set
Tunnel nas-port ignore	Whether the router uses the tunnel peer's NAS-Port [5] attribute; enabled or disabled
Tunnel nas-port-type ignore	Whether the router uses the tunnel peer's NAS-Port-Type [61] attribute; enabled or disabled
Tunnel assignmentId format	Value of the tunnel assignment ID that is passed to PPP/L2TP
Tunnel calling number format	Format configured for L2TP Calling Number AVP 22 generated by the LAC
Tunnel calling number format fallback	Fallback format configured for L2TP Calling Number AVP 22 generated by the LAC

Related Topics

- **show aaa tunnel-parameters** command

Monitoring Global Configuration Status on E-series Routers

Purpose Display the global configuration and status for L2TP on E-series routers, including switched sessions.

Action To display the global configuration and status for L2TP on E-series routers, including switched sessions:

```
host1#show l2tp
Configuration
  L2TP administrative state is enabled
  Dynamic interface destruct timeout is 600 seconds
  Data packet checksums are disabled
  Receive data sequencing is not ignored
  Tunnel switching is disabled
  Retransmission retries for established tunnels is 5
  Retransmission retries for not-established tunnels is 5
  Tunnel idle timeout is 60 seconds
  Failover within a preference level is disabled
  Weighted load balancing is disabled
  Tunnel authentication challenge is enabled
  Calling number avp is enabled
  Reject remote transmit address change is enabled for ip address
  Ignore remote transmit address change is disabled
  Disconnect-cause avp generation is enabled
  Default receive window size is system chooses
```

```
    Rx speed avp when equal is enabled
    Destination lockout timeout is 300 seconds
    Destination lockout test is disabled
    Failover resync is silent-failover
  Sub-interfaces      total      active     failed     auth-errors
    Destinations      0          0          0          n/a
    Tunnels           0          0          0          0
    Sessions          0          0          0          n/a
    Switched-sessions 0          0          0          n/a
```

Meaning Table 80 lists the **show l2tp** command output fields.

Table 80: show l2tp Output Fields

Field Name	Field Description
Configuration	Configuration and status for L2TP on E-series routers, including switched sessions
L2TP administrative state	Status of L2TP on the router; enabled or disabled
Dynamic interface destruct timeout	Number of seconds that the router maintains dynamic destinations, tunnels, and sessions after they have terminated
Data packet checksums	Status of checking data integrity via UDP; enabled or disabled
Receive data sequencing	Whether the router processes or ignores sequence numbers in incoming data packets
Tunnel switching	Enabled or disabled
Retransmission retries for established tunnels	Number of retries configured for established tunnels
Retransmission retries for not-established tunnels	Number of retries configured for tunnels not established
Tunnel idle timeout	Length of the tunnel idle timeout, in seconds
Failover within a preference level	Enabled or disabled
Weighted load balancing	Enabled or disabled
Tunnel authentication challenge	Enabled or disabled
Calling number avp	Whether the E-series LAC sends Calling-Station-Id and Called-Station-Id AVPs in ICRQ packets, enabled or disabled
Reject remote transmit address change	Enabled or disabled for IP address, UDP port, or both
Ignore remote transmit address change	Enabled or disabled for IP address, UDP port, or both
Disconnect-cause avp generation	Enabled or disabled
Default receive window size	Default L2TP RWS for a tunnel on both the LAC and the LNS; displays either the configured value or the default behavior, indicated by `system chooses`
Rx speed avp when equal	Enabled or disabled
Destination lockout timeout	Number of seconds that L2TP destinations remain in the lockout state after they become unavailable
Destination lockout test	Status of the L2TP destination lockout test, enabled or disabled

Table 80: show l2tp Output Fields (continued)

Field Name	Field Description
Failover resync	Global L2TP peer resynchronization configuration
Sub-interfaces	Sub-interface information about L2TP
total	Number of destinations, tunnels, and sessions that the router created
active	Number of operational destinations, tunnels, and sessions
failed	Number of requests that did not reach an operational state
auth-errors	Number of requests that failed because the tunnel password was invalid

Related Topics

- **show l2tp** command

Monitoring Detailed Configuration Information for Specified Destinations

Purpose Display detailed configuration information about specified destinations.

Action To display detailed configuration information about specified destinations:

To display information about a specific destination:

```
host1#show l2tp destination ip 172.31.1.98
L2TP destination 1 is Up with 5 active tunnels and 64 active sessions
```

To display information about all destinations:

```
host1#show l2tp destination detail 1
L2TP destination 1 is Up with 5 active tunnels and 64 active sessions
Configuration
  Administrative state is enabled
  SNMP traps are enabled
Destination address
  Transport ipUdp
  Virtual router default
  Local address 192.168.1.230, peer address 172.31.1.98
Destination status
  Effective administrative state is enabled
Sub-interfaces total active failed auth-errors
  Tunnels      5     5      0      0
  Sessions     64    64     0      n/a
Statistics    packets      octets       discards   errors
  Control rx  69           3251          2          0
  Control tx  195          23939         0          0
  Data rx     68383456     68383456      0          0
  Data tx     68383456     68383456       0         0
```

Meaning Table 81 lists the **show l2tp destination** command output fields.

Table 81: show l2tp destination Output Fields

Field Name	Field Description
Configuration	Configured status of the destination
Administrative state	Administrative status of the destination: ■ enabled—No restrictions on creation and operation of sessions and tunnels for this destination ■ disabled—Router disabled existing sessions and tunnels and will not create new sessions or tunnels for this destination ■ drain—Router will not create new sessions or tunnels for this destination
SNMP traps	Whether or not the router sends traps to SNMP for operational state changes
Destination address	Address information for the specified destination
Transport	Method used to transfer traffic
Virtual	Name of the virtual router on which the tunnel is configured
Local and peer addresses	Addresses of the local and remote interfaces
Destination status	Effective administrative state—The more restrictive of the router and destination administrative states. This setting, rather than the administrative state of the destination, determines whether the router can create new sessions or tunnels and whether the sessions or tunnels are disabled for this destination.
Sub-interfaces	Sub-interface information about the L2TP destination
total	Number of sessions or tunnels that the router created for this destination
active	Number of operational sessions or tunnels for this destination
failed	Number of requests that did not reach an operational state for this destination
auth-errors	Number of requests that failed because the tunnel password was invalid for this destination
Statistics	Information about the traffic sent and received

Related Topics

- **show l2tp destination** command

Monitoring Locked Out Destinations

Purpose Display information about the L2TP destinations that are currently locked out.

Action To display information about the L2TP destinations that are currently locked out:

```
host1#show l2tp destination lockout
L2TP destination 36 is waiting for lockout timeout (45 seconds remaining)
L2TP destination 54 is waiting for lockout test start
L2TP destination 76 is waiting for lockout test complete
3 L2TP lockout destinations found
```

Meaning Table 82 lists the **show l2tp destination lockout** command output fields.

Table 82: show l2tp destination lockout Output Fields

Field Name	Field Description
L2TP destination waiting	Name of destination and its lockout status. The status indicates whether the destination is waiting for the lockout timeout to expire (and how much time is left), or waiting for the lockout test to start or finish
L2TP lockout destinations found	Number of destinations that are currently in lockout state

Related Topics

- **show l2tp destination lockout** command

Monitoring Configured Destination Profiles or Host Profiles

Purpose Display either a list of configured L2TP destination profiles or the host profiles defined in a particular profile.

If a nondefault L2TP RWS is configured for a particular host profile, the command displays the RWS setting as an attribute of that host profile. (See Example 2.)

Action To display either a list of configured L2TP destination profiles or the host profiles defined in a particular profile:

```
host1#show l2tp destination profile
L2TP destination profile westford
1 L2TP destination profile found
```

If a nondefault L2TP RWS is configured for a particular host profile, to display the RWS setting as an attribute of that host profile:

```
host1#show l2tp destination profile westford
L2TP destination profile westford
Configuration
  Destination address
    Transport ipUdp
    Virtual router lns
    Peer address 192.168.1.99
  Destination profile maximum sessions is 5000
```

```
Statistics
  Destination profile current session count is 2
Host profile attributes
  Remote host is remhost22.xyz.com
    Configuration
      Tunnel password is 23erf5
      Interface profile is ebcints
      Bundled group id is 1
      Bundled group id override is enabled
      Maximum sessions is 400
      Failover resync is failover-protocol
    Statistics
      Current session count is 14
  Remote host is asciitext
    Configuration
      Bundled group id is 0
      Tunnel password is 222
      Interface profile is ascints
      Default upper binding type mlppp
      Maximum sessions is 250
      Failover resync is failover-protocol
    Statistics
      Current session count is 2
  Remote host is mexico
    Configuration
      Local ip address is 10.10.2.2
      Proxy lcp is disabled
      Proxy authenticate is enabled
      mlppp upper binding type
      Disconnect-cause avp is enabled
      Receive window size is 4
      Maximum sessions is 500
      Failover resync is failover-protocol
    Statistics
      Current session count is 14
4 L2TP host profiles found
```

Meaning Table 83 lists the **show l2tp destination profile** command output fields.

Table 83: show l2tp destination profile Output Fields

Field Name	Field Description
Destination profile attributes	Destination profile attributes of L2TP destination
Transport	Method used to transfer traffic
Virtual Router	Method used to transfer traffic
Peer address	IP address of the LAC
Destination profile maximum sessions	Maximum number of sessions allowed for the destination profile
Destination profile current session count	Number of current sessions for the destination profile
Host profile attributes	Host profile attributes of L2TP destination
Remote host	Name of the remote host
Local hostname	Name of the local host
Local IP address	IP address of the local host
Bundled group id	Identifier for bundled sessions

Table 83: show l2tp destination profile Output Fields (continued)

Field Name	Field Description
Tunnel password	Password for the tunnel
Interface profile	Name of the host profile
Proxy lcp	Status of proxy LCP for the remote host
mlppp upper binding type	Default upper binding type
Disconnect-cause avp generation	Status of the disconnect cause generation
Receive window size	Number of packets that the peer can transmit without receiving an acknowledgment from the router
Maximum sessions	Maximum number of sessions allowed for the host profile
Failover resync	L2TP peer resynchronization method for the host profile
Current session count	Number of current sessions for the host profile

Related Topics

- **show l2tp destination profile** command

Monitoring Configured and Operational Status of all Destinations

Purpose Display summary of the configured and operational status of all L2TP destinations.

Action To display a summary of the configured and operational status of all L2TP destinations.:

```
host1#show l2tp destination summary
Administrative status    enabled    drain      disabled
                         0          0          0
Operational status       up         down       lower-down not-present
                         0          0          0          0
```

Meaning Table 84 lists the **show l2tp destination summary** command output fields.

Table 84: show l2tp destination summary Output Fields

Field Name	Field Description
Administrative status	Administrative status of the L2TP destination: ■ enabled—No restrictions on creation and operation of sessions and tunnels for this destination ■ drain—Router will not create new sessions or tunnels for this destination ■ disabled—Router disabled existing sessions and tunnels and will not create new sessions or tunnels for this destination

Table 84: show l2tp destination summary Output Fields (continued)

Field Name	Field Description
Operational status	Operational status of the L2TP destination: ■ up—Destination is available for tunnels ■ down—Destination is not available for tunnels ■ lower-down—Underlying transport is unavailable; for example, you removed the virtual router ■ not-present—Hardware supporting the destination is unavailable; for example, you removed a required line module

Related Topics

- **show l2tp destination summary** command

Monitoring Statistics on the Cause of a Session Disconnection

Purpose Display statistics for all information the LAC receives from an LNS about the cause of an L2TP session disconnection.

Action To display statistics for all information the LAC receives from an LNS about the cause of an L2TP session disconnection.

```
host1#show l2tp received-disconnect-cause-summary
Disconnect Cause (Code)                        Global     Peer       Local
---------------------------------------------- ---------- ---------- ----------
no info (0)                                    0          0          0
admin disconnect (1)                           0          0          0
renegotiation disabled (2)                     0          0          0
normal disconnect (3)                          0          0          0
compulsory encryption refused (4)              0          0          0
lcp failed to converge (5)                     0          0          0
lcp peer silent (6)                            0          0          0
lcp magic number error (7)                     0          0          0
lcp keepalive failure (8)                      0          0          0
lcp mlppp endpoint discriminator mismatch (9)  0          0          0
lcp mlppp peer mrru not valid (10)             0          0          0
lcp mlppp peer ssn invalid (11)                0          0          0
lcp callback refused (12)                      0          0          0
authenticate timed out (13)                    0          0          0
authenticate mlppp name mismatch (14)          0          0          0
authenticate protocol refused (15)             0          0          0
authenticate failure (16)                      0          0          0
ncp no negotiation completed (17)              0          0          0
ncp no ncps available (18)                     0          0          0
ncp addresses failed to converge (19)          0          0          0
ncp negotiation inhibited (20)                 0          0          0
```

Meaning Table 85 lists the **show l2tp received-disconnect-cause-summary** command details.

Table 85: show l2tp received-disconnect-cause-summary Output Fields

Field Name	Field Description
show l2tp received-disconnect-cause-summary	Display statistics for all information the LAC receives from an LNS about the cause of an L2TP session disconnection.

Related Topics

- **show l2tp received-disconnect-cause-summary** command

Monitoring Detailed Configuration Information about Specified Sessions

Purpose Display detailed configuration information about specified sessions.

Action To display detailed configuration information about specified sessions:

To display L2TP session:

```
host1#show l2tp session
L2TP session 1/1/1 is Up
1 L2TP session found
```

To display L2TP session details:

```
host1#show l2tp session detail
L2TP session 1/1/1 is Up
Configuration
  Administrative state is enabled
  SNMP traps are enabled
Session status
  Effective administrative state is enabled
  State is established
  Local session id is 25959, peer session id is 2
Statistics packets octets discards errors
  Data rx  7       237    1        0
  Data tx  6       160    0        0

Session operational configuration
  User name is 't1.s1@local'
  Tunneling PPP interface atm 0/0.1
  Call type is lacIncoming
  Call serial number is 0
  Bearer type is none
  Framing type is none
  Proxy LCP was provided
  Authentication method was chap
  Tunnel switch profile is chicago
```

Meaning Table 86 lists the **show l2tp session** command output fields.

Table 86: show l2tp session Output Fields

Field Name	Field Description
Configuration	Configured status of the session
Administrative state	Administrative status of the destination: ■ enabled—No restrictions on the operation of this session ■ disabled—Router terminated this session
SNMP traps	Whether or not the router sends traps to Simple Network Management Protocol (SNMP) for operational state changes
Session status	Session status of the destination
Effective administrative state	Most restrictive of the following administrative states: router, destination, tunnel, and session. This setting, rather than the administrative state of the session, determines whether the router can maintain this session or not.
State	Status of the session: idle, connecting, established, or disconnecting
Local and peer session id	Names the router uses to identify the session locally and remotely
Statistics	Information about the traffic for this session
Session operational configuration	Information received from the peer when the session was created

Related Topics

- **show l2tp session** command

Monitoring Configured and Operational Summary Status

Purpose Display a summary of the configured and operational status of all L2TP sessions.

Action To display a summary of the configured and operational status of all L2TP sessions:

```
host1#show l2tp session summary
Administrative status  enabled   disabled
                       64        0
Operational status     up        down   lower-down   not-present
           64        0      0           0
```

Meaning Table 87 lists the **show l2tp session summary** command output fields.

Table 87: show l2tp session summary Output Fields

Field Name	Field Description
Administrative status:	Administrative status of the session: ■ enabled—No restrictions on the creation of sessions ■ disabled—Router disabled these sessions
Operational status:	Operational status of the session: ■ up—Session is available ■ down—Session is unavailable ■ lower-down—Session is unavailable because the tunnel supporting it is inaccessible ■ not-present—Session is unavailable because the hardware (such as a line module) supporting it is inaccessible

Related Topics

- **show l2tp session summary** command

Monitoring Configured Switch Profiles on Router

Purpose Display information about the L2TP switch profiles configured on the router.

Action To display only the names of the L2TP tunnel switch profiles configured on the router:

```
host1#show l2tp switch-profile
L2TP tunnel switch profile concord
L2TP tunnel switch profile myProfile
2 L2TP tunnel switch profiles found
```

To display information about the settings in a particular L2TP tunnel switch profile:

```
host1#show l2tp switch-profile concord
L2TP tunnel switch profile concord
  AVP bearer type action is relay
  AVP calling number action is relay
  AVP Cisco nas port info action is relay
```

Meaning Table 88 lists the **show l2tp switch-profile** command output fields.

Table 88: show l2tp switch-profile Output Fields

Field Name	Field Description
L2TP tunnel switch profile	Name of the L2TP tunnel switch profile
AVP *actionType* action is	Indicates the tunnel switching behavior or action type (for example, relay) configured for the specified L2TP AVP type

Related Topics

- **show l2tp switch-profile** command

Monitoring Detailed Configuration Information about Specified Tunnels

Purpose Display detailed configuration information about specified tunnels.

Action To display detailed configuration information about specified tunnel by ip address:

```
host1#show l2tp tunnel virtual router default ip 172.31.1.98
L2TP tunnel 1/xyz is Up with 13 active sessions
L2TP tunnel 1/aol.com is Up with 13 active sessions
L2TP tunnel 1/isp.com is Up with 13 active sessions
L2TP tunnel 1/msn.com is Up with 13 active sessions
L2TP tunnel 1/mv.com is Up with 12 active sessions
5 L2TP tunnels found
```

To display detailed configuration information about specified tunnel:

```
host1#show l2tp tunnel detail 1/xyz
L2TP tunnel 1/xyz is Up with 13 active sessions
Configuration
  Administrative state is enabled
  SNMP traps are enabled
Tunnel address
  Transport ipUdp
  Virtual router default
  Local address 192.168.1.230, peer address 172.31.1.98
  Local UDP port 1701, peer UDP port: 1701
Tunnel status
  Effective administrative state is enabled
  State is established
  Local tunnel id is 14529, peer tunnel id is 34
Sub-interfaces    total   active   failed
  Sessions        13      13       0
Statistics    packets      octets       discards   errors
  Control rx  14           683          0          0
  Control tx  41           4666         0          0
  Data rx     67900944     67900944     0          0
  Data tx     67900944     67900944     0          0
Control channel statistics
  Receive window size = 4
  Receive ZLB = 17
  Receive out-of-sequence = 0
  Receive out-of-window = 0
  Transmit window size = 4
  Transmit ZLB = 12
  Transmit queue depth = 0
  Retransmissions = 8
Tunnel operational configuration
  Peer host name is 'Juniper-POS'
  Peer vendor name is 'XYZ, Inc.'
  Peer protocol version is 1.1
  Peer firmware revision is 0x1120
  Peer bearer capabilities are digital and analog
  Peer framing capabilities are sync and async
```

Meaning Table 89 lists the **show l2tp tunnel** command output fields.

Table 89: show l2tp tunnel Output Fields

Field Name	Field Description
Configuration	Configured status of the tunnel enabled
Administrative state	Administrative status of the enabled tunnel: ■ enabled—No restrictions on creation and operation of sessions for this tunnel ■ disabled—Router disabled existing sessions and will not create new sessions on this tunnel ■ drain—Router will not create new sessions on this tunnel
SNMP traps	Whether or not the router sends traps to SNMP for operational state changes
Tunnel address	Tunnel address information.
Transport	Method used to transfer traffic
Virtual router	Name of the virtual router on which the tunnel is configured
Local and peer addresses	IP addresses of the local and remote ends of the tunnel. If the router is set up to ignore address and port changes in SCCRP packets, both the transmit and receive addresses are listed for the peer.
Local and peer UDP ports	UDP ports for the local and remote ends of the tunnel. If the router is set up to accept address and port changes in SCCRP packets, both the transmit and receive UDP ports are listed for the peer.
Tunnel status	Tunnel status information.
Effective administrative state	Most restrictive of the following administrative states: E-series router, destination, and tunnel. This setting, rather than the administrative state of the tunnel, determines whether the router can create new sessions on a tunnel or whether the sessions on a tunnel are disabled or not.
State	Status of the enabled tunnel: ■ idle ■ connecting ■ established ■ disconnecting
Local and peer tunnel id	Names the router used to identify the tunnel locally and remotely
Sub-interfaces:	Sub-interface information for the enabled tunnel: ■ total—Number of sessions that the router has created on this tunnel ■ active—Number of operational sessions on the tunnel ■ failed—Number of requests that did not reach an operational state
Statistics	Information about the traffic sent and received
Control channel statistics	Tunnel control channel information

Table 89: show l2tp tunnel Output Fields (continued)

Field Name	Field Description
Receive window size	Number of packets that the peer can transmit without receiving an acknowledgment from the router.
Receive ZLB	Number of acknowledgments that the router has received from the peer.
Receive out-of-sequence	Number of received control packets that were out of order.
Receive out-of-window	Number of packets that arrived at the router outside the receiving window.
Transmit window size	Number of packets that the router can transmit before receiving an acknowledgment from the peer.
Transmit ZLB	Number of acknowledgments that the router has sent to the peer.
Transmit queue depth	Number of packets that the router is waiting to send to the peer, plus the number of packets for which the peer has not yet acknowledged receipt.
Tunnel operation configuration	Information received from the peer when the tunnel was created

Related Topics

- **show l2tp tunnel** command

Monitoring Configured and Operational Status of All Tunnels

Purpose Display a summary of the configured and operational status of all L2TP tunnels.

Action To display a summary of the configured and operational status of all L2TP tunnels:

```
host1#show l2tp tunnel summary
Administrative status   enabled   drain   disabled
                        5         0       0
Operational status      up        down    lower-down   not-present
              5         0         0       0            0
```

Meaning Table 90 lists the **show l2tp tunnel summary** command output fields.

Table 90: show l2tp tunnel summary Output Fields

Field Name	Field Description
Administrative status	Administrative status of all tunnels: ■ enabled—No restrictions on the creation and operation of sessions for this tunnel ■ drain—Router will not create new sessions for this tunnel ■ disabled—Router disabled existing sessions and will not create new sessions for this tunnel

Table 90: show l2tp tunnel summary Output Fields (continued)

Field Name	Field Description
Operational status	Operational status of all tunnels: ■ up—Tunnel is available ■ down—Tunnel is unavailable ■ lower-down—Tunnel is unavailable because the destination supporting it is inaccessible ■ not-present—Tunnel is unavailable because the hardware (such as a line module) supporting the tunnel is inaccessible

Related Topics

- **show l2tp tunnel summary** command

Monitoring Chassis-wide Configuration for L2TP Dial-out

Purpose To display the chassis-wide configuration, operational state, and statistics for L2TP dial-out.

This command displays aspects of the dial-out state machine and details about the dial-out routes themselves. This section presents sample output. The actual output on your router may differ significantly.

Action To display chassis-wide configuration, operational state, and statistics for L2TP dial-out:

```
host1#show l2tp dial-out
Operational status: inService
Connecting timer value: 30 seconds
Dormant timer value: 300 seconds
```

To display detailed chassis-wide configuration information:

```
host1#show l2tp dial-out detail
    Dial-out Chassis Configuration and Operational Status
      Chassis operational status :   inService
      Dormant timeout            :   30 seconds
      Connecting timeout         :   30 seconds

Dial-out Chassis Statistics
  Current sessions:                                0
  Maximum sessions:                                0
  Current sessions in the process of connecting:   0
  Maximum sessions connecting at one time:         0
  Current sessions pending:                        0
  Maximum sessions pending:                        0
  Current targets inhibited:                       0
  Maximum targets inhibited:                       0
  Authentication grant for nonexistent session:    0
  Authentication deny for nonexistent session:     0

Dial-out Virtual router statistics
  Virtual routers active:                      0
  Virtual routers created:                     0
```

```
  Virtual routers removed:                      0
  Virtual routers in init-pending state:        0
  Virtual routers in init-failed state:         0
  Virtual routers in down state:                0
  Virtual routers in in-service state:          0
  IP Discarded trigger frames:                  0
  Trigger frames received for unknown route:    0
  Sessions in dormant state:                    0
  Sessions in pending state:                    0
  Sessions in authenticating state:             0
  Sessions in connecting state:                 0
  Sessions in in-service state:                 0
  Sessions in inhibited state:                  0
  Sessions in post-inhibited state:             0
  Sessions in failed state:                     0

Dial-out target statistics
  Targets active:                               0
  Targets created:                              0
  Targets removed:                              0
  Targets in down state:                        0
  Targets in inhibited state:                   0
  Targets in in-service state:                  0
  Triggers discarded:                           0
Dial-out session statistics
  Sessions active:                              0
  Sessions created:                             0
  Sessions removed:                             0
  Sessions reset:                               0
  Triggers received:                            0
  Triggers enqueued:                            0
  Triggers discarded:                           0
  Triggers forwarded:                           0
  Triggers max enqueued:                        0
  Authentication requests:                      0
  No resources for authentication:              0
  Authentication grants:                        0
  Authentication Denies:                        0
  Dial-outs requested:                          0
  Dial-outs rejected:                           0
  Dial-outs established:                        0
  Dial-outs timed out:                          0
  Dial-outs torn down:                          0
```

To display summary information for chassis-wide configuration:

```
host1#show l2tp dial-out summary
      Virtual routers in init pending state :             0
      Virtual routers in init failed state  :             0
      Virtual routers in down state         :             0
      Virtual routers in inService state    :             0
      Targets in down state                 :             0
      Targets in inhibited state            :             0
      Targets in inService state            :             0
      Sessions in dormant state             :             0
      Sessions in pending state             :             0
      Sessions in authenticating state      :             0
      Sessions in connecting state          :             0
      Sessions in inService state           :             0
      Sessions in inhibited state           :             0
      Sessions in postInhibited state       :             0
      Sessions in failed state              :             0
```

To display information about the operational or administrative state:

```
host1#show l2tp dial-out state inService
```

Meaning Table 91 lists the **show l2tp dial-out** command output fields.

Table 91: show l2tp dial-out Output Fields

Field Name	Field Description
Operational status	Current operational status of the chassis
Connecting timer value	Configuration of the connecting timeout
Dormant timer value	Configuration of the dormant timeout
Dial-out Chassis Statistics	Statistics at the chassis level
Current sessions	Total number of session currently active on the chassis
Maximum sessions	Highest value of current sessions recorded on the chassis since the last router restart
Current sessions in the process of connecting	Sessions currently in the connecting state
Maximum sessions connecting at one time	Highest number of sessions recorded on the chassis at the same time since the last router restart
Current sessions pending	Sessions in the pending state
Maximum sessions pending	Highest number of sessions recorded in the pending state since the last router restart
Current targets inhibited	Targets currently in the inhibited state
Maximum targets inhibited	Highest value of targets recorded in the inhibited state since the last router restart
Authentication grant for nonexistent session	Number of authentication requests granted to nonexistent sessions
Authentication deny for nonexistent session	Number of authentication requests denied to nonexistent sessions
Dial-out Virtual router statistics	Statistics at the virtual router level
Virtual routers active	VRs in use by the state machine
Virtual routers created	VRs that have been used by the state machine
Virtual routers removed	VRs no longer used by the state machine
Virtual routers in init-pending state	VRs in the initializationPending state
Virtual routers in init-failed state	VRs in the initializationFailed state
Virtual routers in down state	VRs in the down state
Virtual routers in in-service state	VRs in the inService state
IP Discarded trigger frames	Trigger frames that IP discarded
Trigger frames received for unknown route	Trigger frames received for an unknown route
Sessions in dormant state	Sessions on the VR that are in the dormant state
Sessions in pending state	Sessions on the VR that are in the pending state
Sessions in authenticating state	Sessions on the VR that are in the authenticating state

Table 91: show l2tp dial-out Output Fields (continued)

Field Name	Field Description
Sessions in connecting state	Sessions on the VR that are in the connecting state
Sessions in in-service state	Sessions on the VR that are in the inService state
Sessions in inhibited state	Sessions on the VR that are in the inhibited state
Sessions in post-inhibited state	Sessions on the VR that are in the postInhibited state
Sessions in failed state	Sessions on the VR that are in the failed state
Dial-out target statistics	Statistics at the route target level
Targets active	Current active targets
Targets created	All targets created
Targets removed	Targets deleted
Targets in down state	Targets in the down state
Targets in inhibited state	Targets in the inhibited state
Targets in in-service state	Targets in the inService state
Triggers discarded	Trigger packets discarded
Dial-out session statistics	Statistics at the session level
Sessions active	Currently active sessions
Sessions created	All sessions created
Sessions removed	Sessions deleted
Sessions reset	Sessions reset using the **l2tp dial-out session reset** command
Triggers received	Triggers received for dial-out sessions
Triggers enqueued	Triggers that have been put into the queue
Triggers discarded	Trigger packets discarded
Triggers forwarded	Trigger packets forwarded
Triggers max enqueued	Maximum number of triggers that have been enqueued simultaneously since the last router reset
Authentication requests	Authentication requests received
No resources for authentication	Authentication requests not processed because of insufficient resources
Authentication grants	Authentication requests granted
Authentication Denies	Authentication requests denied
Dial-outs requested	Outgoing calls requested for sessions
Dial-outs rejected	Outgoing call requests that were rejected
Dial-outs established	Successful outgoing calls before the connecting timer expired
Dial-outs timed out	Number of times the connecting timer expired
Dial-outs torn down	Successful outgoing calls that were terminated

Related Topics

- For detailed information about operational states, see *Dial-Out Operational States* on page 350
- **show l2tp dial-out** command
- **show l2tp dial-out virtual-router** command

Monitoring Status of Dial-out Sessions

Purpose Display the status of dial-out sessions.

This command displays aspects of the dial-out state machine and details about the dial-out routes themselves. This section presents sample output. The actual output on your router may differ significantly.

Action To display all sessions within the current virtual router context:

```
host1#show l2tp dial-out session
Session           Status
---------         ---------
10.10.1.1         connected
10.10.2.1          dormant
```

To display detailed information about a particular session, specify the trigger IP address for the session:

```
host1#show l2tp dial-out session 10.1.1.1
Session 10.1.1.1
Operational status: dormant
```

To display aggregate counts for dial-out sessions in each of the possible operational and administrative states:

```
host1#show l2tp dial-out session summary
```

To display detailed configuration, state, and statistics:

```
host1#show l2tp dial-out session detail
```

To display information about the operational or administrative state:

```
host1#show l2tp dial-out session state connecting
```

To display dial-out information across all virtual routers

```
host1#show l2tp dial-out session allVirtualRouters
```

NOTE: The level of a user's permission determines the use of the **allVirtualRouters** option. For example, if you have permission to view only the current virtual router, then that is all that is displayed when you enter a command.

Meaning Table 92 lists the **show l2tp dial-out session** command output fields.

Table 92: show l2tp dial-out session Output Fields

Field Name	Field Description
Session	IP address of the session
Status	Current status of the session
Operational status	Current operational status of session

Related Topics

- For detailed information about operational states, see *Dial-Out Operational States* on page 350
- **show l2tp dial-out session** command

Monitoring Dial-out Targets within the Current VR Context

Purpose Display configured dial-out targets within the current virtual router context.

This command displays aspects of the dial-out state machine and details about the dial-out routes themselves. This section presents sample output. The actual output on your router may differ significantly.

Action To display general information for all targets within the virtual router:

```
host1:dialout#show l2tp dial-out target
Target         Status     Active Sessions
------         ------     ---------------
10.10.1.1/16   up         14
10.1.1.0/24    up         10
```

To display detailed information about a particular target, specify the target IP address and mask:

```
host1:dialout#show l2tp dial-out target 10.1.1.0/24
Target 10.1.1.0/24
Operational status: up
Active sessions: 10
Total triggers: 127
Failed sessions: 2
Connected sessions: 8
```

To display aggregate counts for targets in each of the possible operational and administrative states:

```
host1:dialout#show l2tp dial-out target summary
```

To display detailed configuration, state, and statistics:

```
host1:dialout#show l2tp dial-out target detail
```

To display information about the operational or administrative state:

```
host1:dialout#show l2tp dial-out target state inService
```

To displays dial-out information across all virtual routers:

```
host1:dialout#show l2tp dial-out target allVirtualRouters
```

NOTE: The level of a user's permission determines the use of the **allVirtualRouters** option. For example, if you have permission to view only the current virtual router, then that is all that is displayed when you enter a command.

Meaning Table 93 lists the **show l2tp dial-out target** command output fields.

Table 93: show l2tp dial-out target Output Fields

Field Name	Field Description
Target	Address of the target
Status	Status of the connection to the target
Active Sessions	Currently active session to the target
Total triggers	Trigger packets received for the target
Failed sessions	Sessions that are currently in the failed state
Connected sessions	Sessions that are currently in the connected state

Related Topics

- For detailed information about operational states, see *Dial-Out Operational States* on page 350
- **show l2tp dial-out target** command

Monitoring Operational Status within the Current VR Context

Purpose Display dial-out state machine operational status and statistics within the current VR context.

This command displays aspects of the dial-out state machine and details about the dial-out routes themselves. This section presents sample output. The actual output on your router may differ significantly.

Action To display dial-out state machine operational status and statistics within the current VR context:

```
host1#show l2tp dial-out virtual-router
Dial-out Virtual Router Configuration and Operational Status
    Virtual router host1:
    Virtual router operational status: inService
    Maximum trigger buffers per session: 0
```

To display aggregate counts for dial-out state machines in each of the possible operational and administrative states:

```
host1:dialout#show l2tp dial-out virtual-router summary
```

To display detailed configuration, state, and statistics:

```
host1:dialout#show l2tp dial-out virtual-router detail
```

To display information about the operational or administrative state:

```
host1:dialout#show l2tp dial-out virtual-router state down
```

To displays dial-out information across all virtual routers:

```
host1:dialout#show l2tp dial-out virtual-router allVirtualRouters
```

NOTE: The level of a user's permission determines the use of the **allVirtualRouters** option. For example, if you have permission to view only the current virtual router, then that is all that is displayed when you enter a command.

Meaning Table 94 lists the **show l2tp dial-out virtual-router** command output fields.

Table 94: show l2tp dial-out virtual-router Output Fields

Field Name	Field Description
Virtual router	Name of VR
Virtual router operational status	Operational status of the VR
Maximum trigger buffers per session	Maximum number of trigger packets held in buffer while the dial-out session is being established

Related Topics

- For detailed information about operational states, see *Dial-Out Operational States* on page 350
- **show l2tp dial-out virtual-router** command

Part 4

Managing DHCP

Chapter 17

DHCP Overview

The Dynamic Host Configuration Protocol (DHCP) provides a mechanism through which computers using Transmission Control Protocol/IP (TCP/IP) can obtain protocol configuration parameters automatically from a DHCP server on the network.

The following sections provide overview information for the E-series router DHCP support:

DHCP Overview Information

The most important configuration parameter carried by DHCP is the IP address. A computer must be initially assigned a specific IP address that is appropriate to the network to which the computer is attached and that is not assigned to any other computer on that network. If you move a computer to a new network, it must be assigned a new IP address for that new network. You can use DHCP to manage these assignments automatically.

An IP client contacts a DHCP server for configuration parameters. The DHCP server is typically centrally located and operated by the network administrator. Because the server is run by a network administrator, DHCP clients can be reliably and dynamically configured with parameters appropriate to the current network architecture.

You can configure the E-series router to support the following DHCP features:

- DHCP access model
- DHCP proxy client
- DHCP relay
- DHCP relay proxy
- DHCP local server
- DHCP external server

Session and Resource Control Software

The Session and Resource Control (SRC) software, formerly the Service Deployment System (SDX) software is a component of Juniper Networks management products. The SRC software provides a Web-based interface that allows subscribers to access services, such as the Internet, an intranet, or an extranet.

When a DHCP subscriber logs in, the SRC software can authorize the address request and select the DHCP address pool on the router from which the DHCP address is selected. The SRC software can also control the number of IP addresses that are given to a particular retailer or subscriber and control the lease time of IP addresses assigned to DHCP subscribers.

DHCP Platform Considerations

For information about modules that support DHCP on the ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, ERX Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support DHCP.

For information about modules that support DHCP on the E120 router and the E320 router:

- See *E120 and E320 Module Guide, Table 1, Module and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support DHCP.

DHCP References

For more information about DHCP, consult the following resources:

- DSL Forum Technical Report (TR)-101—Migration to Ethernet-Based DSL Aggregation (April 2006)
- RFC 2131—Dynamic Host Configuration Protocol (March 1997)
- RFC 2132—DHCP Options and BOOTP Vendor Extensions (March 1997)
- RFC 3046—DHCP Relay Agent Information Option (January 2001)
- RFC 3315—Dynamic Host Configuration Protocol for IPv6 (DHCPv6) (July 2003)
- RFC 3633—IPv6 Prefix Options for Dynamic Host Configuration Protocol (DHCP) Version 6 (December 2003)
- RFC 4243—Vendor-Specific Information Suboption for the Dynamic Host Configuration Protocol (DHCP) Relay Agent Option (December 2005)

NOTE: IETF drafts are valid for only 6 months from the date of issuance. They must be considered as works in progress. Please refer to the IETF Web site at http://www.ietf.org for the latest drafts.

For information about supported accounting attributes, see *Chapter 3, Configuring RADIUS Attributes* and *Chapter 6, RADIUS Attribute Descriptions*

Configuring the DHCP Access Model

The E-series router provides a DHCP access model, which enables you to integrate the router into an existing RADIUS-based operation support system (OSS). In the DHCP access model, a DHCP local server or DHCP external service is configured, but the E-series router does not have direct interaction with an OSS or a policy server, such as the SRC software. The router passes the client's DHCP options, client's media access control (MAC) address and, if appropriate, the DHCP relay's IP address in RADIUS requests for authentication.

To configure the DHCP access model to pass the client's information in RADIUS requests, you enable the DHCP options feature, then specify the client information to be passed to RADIUS. You can specify that the client's MAC address be included in the request. You can also specify that the DHCP relay's IP address be sent, if appropriate. For descriptions of the RADIUS attributes used with the DHCP access model, see *Chapter 3, Configuring RADIUS Attributes*.

Configuring DHCP Proxy Clients

DHCP proxy client support enables the router to obtain an IP address from a DHCP server for a remote PPP client. Each virtual router (acting as a DHCP proxy client) can query up to five DHCP servers.

For PPP users, the router acts as a DHCP client to obtain an address for the user. This is referred to as DHCP proxy.

The process for PPP users is as follows:

1. The remote user dials in, and the client requests RADIUS authentication.
2. The AAA server on the router sends a request to the DHCP proxy client on the router for an IP address to be assigned to the remote user's host.
3. The proxy client assumes the role of DHCP client and sends a discovery message to each DHCP server.
4. One or more of the DHCP servers responds with an offer message containing an IP address.
5. The proxy client determines which offer to accept and sends a message to that DHCP server requesting that IP address.
6. The DHCP server responds to the proxy client with an acknowledgment message.
7. The proxy client passes the IP address to the authentication, authorization, and accounting (AAA) server on the router, and the AAA server returns the address to PPP. PPP then assigns the address to the remote host. The new IP address is included when the router next updates its routing table.

Dynamic IP addresses are *leased* to the remote host for a specific period of time, which can range from minutes to days. At the halfway point in the lease period, the proxy client requests an extension from the DHCP server on behalf of the remote host. The lease is extended for a period specified in the acknowledgment (ACK) message returned by the DHCP server—typically equal to the original lease. If the DHCP server returns a negative acknowledgment (NAK) message to the proxy client, the proxy client notifies the server on the router that the extension has been denied. The AAA server logs out the remote host and frees the IP address for reuse.

When a remote host disconnects, the AAA server notifies the proxy client that the IP address is available for reuse. The proxy client informs the DHCP server, which can now reassign that IP address.

For additional information on managing client bindings, see *Viewing and Deleting DHCP Client Bindings* on page 398.

To configure a proxy client from Global Configuration mode:

1. Specify the address of the DHCP server that will provide IP addresses for remote hosts. You can specify a maximum of five DHCP servers.

   host1(config)#**ip dhcp-server 10.6.128.10**

2. Direct the router to request IP addresses for remote users from the DHCP server(s).

   host1(config)#**ip address-pool dhcp**

Related Topics

- **ip address-pool** command
- **ip dhcp-server** command

Logging DHCP Packet Information

The JUNOSe software enables you to collect and log DHCP packet information for all JUNOSe DHCP access models on a per-interface basis. To log packets for a specific DHCP application, you enable DHCP packet logging on the interface that serves the application. JUNOSe software supports per-interface DHCP packet logging on a maximum of 16 interfaces. Per-interface DHCP packet logging is disabled by default.

You can specify which packets are logged—receive, transmit, or all. You can optionally assign low or high priority to the logged packets. Packets are assigned a low priority by default, which does not interfere with router DHCP packet processing. The logged packets are output to the dhcpCapture event logging category.

You can configure per-interface DHCP packet logging on statically configured and dynamically created IP interfaces. However, configuration information for dynamic interface configurations is lost after a cold restart. Both static and dynamic interface configuration information is maintained after a warm restart.

You use the **ip dhcp-capture** command with the following keywords to enable DHCP packet logging for all DHCP applications on the interface.

- Use the **receive**, **transmit**, and **all** keywords to specify the type of DHCP packets that is logged.
- Use the optional **priority** keyword to assign a **low** or **high** priority to logged packets. By default, logged packets have a low priority and do not interfere with the router's DHCP packet processing.

You can specify DHCP packet logging on a maximum of 16 interfaces.

- To enable DHCP packet logging:

  host1(config-if)#**ip dhcp-capture all**

Related Topics

- **ip dhcp-capture** command

Viewing and Deleting DHCP Client Bindings

The JUNOSe software provides commands that enable you to manage your router's DHCP external server, DHCP local server, and DHCP relay proxy client bindings. A client binding associates an IP address with a DHCP client, and describes both the client (for example hardware address and state) and the IP address (for example subnet and lease time).

The commands enable you to view information about current DHCP bindings, and to remove current bindings that are no longer needed. Use the **show dhcp binding** command to display information for current client bindings and track lease times and status. Use the **dhcp delete-binding** command to delete a connected user's IP address lease and the associated route configuration. When you delete a client binding, the lease is removed on the router. You might delete client bindings to:

- Recover functional resources from a user who has not explicitly terminated connectivity and whose lease is unexpired.
- Discontinue connectivity to a user, prompting or forcing the user to request a new lease in order to reestablish network connectivity.

NOTE: This command replaces the **clear ip dhcp-local binding** and **dhcp-external delete-binding** commands, which are deprecated and might be removed in a future release.

You can use the following keywords with the **dhcp delete-binding** command:

  - **all**—Specifies all DHCP local server, DHCP external server, and DHCP relay proxy client bindings
  - **all-local**—Specifies all DHCP local server client bindings
  - **all-external**—Specifies all DHCP external server client bindings
  - **all-relay-proxy**—Specifies all DHCP relay proxy client bindings
  - **binding-id**—Specifies a particular binding ID

- To delete all external bindings:

  host1#**dhcp delete-binding all-external**

- To delete a specific binding:

  host1#**dhcp delete-binding binding-id 3972819365**

Related Topics

- **dhcp delete-binding** command

Chapter 18

DHCP Local Server Overview

This chapter provides an overview of the DHCP local server on the E-series router. This chapter contains the following sections:

Embedded DHCP Local Server Overview

The router offers an embedded DHCP server, known as the DHCP local server. The DHCP local server has two modes: equal-access and standalone.

NOTE: E-series routers also support an embedded DHCP version 6 (DHCPv6) local server. The DHCPv6 local server provides a subset of the features of the DHCP local server. For information about configuring the DHCPv6 local server, see *Configuring the DHCPv6 Local Server* on page 417.

- In equal-access mode, the DHCP local server works with the Juniper Networks SRC software to provide an advanced subscriber configuration and management service.
- In standalone mode, the DHCP local server provides a basic DHCP service, and also allows you to configure AAA authentication for incoming DHCP clients. Also, after successful authentication, the DHCP local server uses the information in the client's AAA subscriber record together with the client's DHCP parameters to select the IP address pool used for address assignment.

  DHCP local server also supports RADIUS accounting, including interim accounting, in standalone mode. This feature allows you to use RADIUS start and stop attributes to track user events such as the lifetime of an IP address.

DHCP Local Server and Client Configuration

You can use DHCP to configure the router to allow remote access to non-PPP clients. DHCP-based access is also an alternative to PPP in environments such as Public Wireless LANs (PWLANs). In PWLANS, a user scans for available broadband networks, then is redirected to a web-based authentication mechanism to request service.

DHCP provides address assignment information for users. Authentication, authorization, and accounting are separate processes, and are up to the Internet service provider (ISP) to define.

The DHCP local server can configure a client with the following DHCP options:

- Default router
- DNS server
- Domain name
- Lease time
- Grace period for address lease
- NetBIOS name server
- NetBIOS node type
- Subnet mask

For additional information on managing client bindings, see *Viewing and Deleting DHCP Client Bindings*, in *Chapter 17, DHCP Overview*.

Equal-Access Mode Overview

In equal-access mode, the router enables access to non-PPP users. Non-PPP equal access requires the use of the router's DHCP local server and SRC software, which communicates with a RADIUS server.

The DHCP local server performs the following functions in equal-access mode:

- Communicates with SRC software.
- Assigns an IP address that enables the subscriber to access services.

Local Pool Selection and Address Allocation

The DHCP local server selects a DHCP pool from which to allocate an address using the framed IP address or pool name parameters. The router compares the parameters with the local DHCP pools in the order presented in Table 95. When the router finds a match, it selects a pool based on the match and does not examine other parameters.

Table 95: Local Pool Selection in Equal-Access Mode

Field	How the DHCP Local Server Uses the Field
Framed IP address	The client's RADIUS entry can be configured with a framed IP address, which the DHCP local server can get from the SRC software. If the router selects a pool using a framed IP address, the DHCP local server attempts to allocate the framed IP address from the pool. If the framed IP address is not available, then the server allocates the next available address in the pool to the client.
Pool name	Each DHCP local pool has a pool name. The client's RADIUS entry can also be configured with a pool name, which the DHCP local server can get from the SRC software. The SRC software must be configured to send RADIUS attributes to DHCP.
Domain name	You can use a domain name as the name of a DHCP local pool. If the client logs onto the SRC software and RADIUS authenticates the client using a domain name, the DHCP local server receives the domain name from the SRC software. If the client's domain name does not match the name of the DHCP local pool, the router attempts to match the client's domain name to the domain name field within the pool.
Giaddr	A DHCP local pool is configured with a network address. A gateway IP address (giaddr), which indicates a client's subnetwork, can be presented to the DHCP local server in the client's DHCP request message. The giaddr field in the DHCP request message usually contains the IP address of a DHCP relay server. The router attempts to match the giaddr address in the DHCP request message with the network address of a DHCP local pool.

The Connection Process

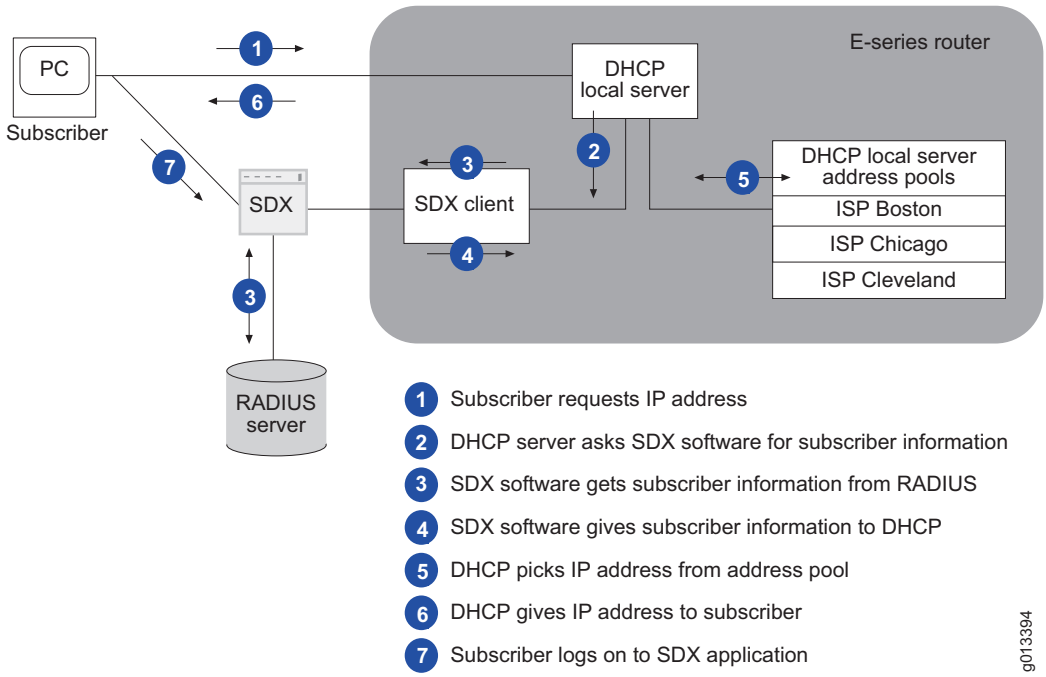
The following sequence describes how the subscriber connects to the network for the first time using equal-access mode. Figure 11 illustrates the process.

1. The subscriber's computer boots and issues a DHCP request.
2. The DHCP local server uses the SRC client to issue a COPS request to retrieve address pool information.
3. After standard DHCP negotiations, the DHCP local server supplies an IP address to the subscriber's computer from a local address pool, as described in the previous section.

   The router maintains a host route that maps the IP address to the router's interface associated with the subscriber's computer.
4. The subscriber's computer retains the IP address until the subscriber turns off the computer.

NOTE: If a DHCP client attempts to renew its address and the DHCP server receives the request on a different interface than the interface that the client originally used, the DHCP server sends a NAK message to the client, forcing the client to begin the DHCP connection process again.

Figure 11: Non-PPP Equal Access via the Router



Standalone Mode Overview

In standalone mode, the DHCP local server operates as a basic DHCP server. Clients are not authenticated by default; however, you can optionally configure the DHCP local server to use AAA authentication for the incoming clients. The DHCP local server receives DHCP client requests for addresses, selects DHCP local pools from which to allocate addresses, distributes addresses to the clients, and maintains the resulting DHCP bindings in a server management table.

Local Pool Selection and Address Allocation

In standalone mode, the DHCP local server selects a pool to allocate an address for a client; the SRC software is never notified or queried. The process used depends on whether AAA authentication is configured.

- If AAA authentication is not configured, the DHCP local server selects a pool by matching the local pool network address to the giaddr or the received interface IP address. The router first attempts to match the giaddr to a local pool network address. If it does not find a match, the router attempts to match the received interface IP address to a local pool network address.

  - Giaddr—A giaddr, which indicates a client's subnetwork, can be presented to the DHCP local server in the client DHCP REQUEST message. The giaddr field in the DHCP request message usually contains the IP address of a DHCP relay server. The router attempts to match the giaddr address in the DHCP request message with the network address of a DHCP local pool. If it finds a match, the router uses the matching DHCP local pool.

- Received interface IP address—The router uses the IP address of the interface on which the DHCP packet is being processed.

After the router selects a DHCP local pool, the DHCP local server first tries to find a reserved IP address for the client in the selected pool. If no reserved address is available, the router attempts to allocate a client's requested IP address. If the requested IP address is not available, the router allocates the next available address in the pool. If a grace period is configured for the pool, the router assigns the grace period to the allocated address.

- If AAA authentication is configured (as described in *Configuring AAA Authentication for DHCP Local Server Standalone Mode* on page 415) and the authentication is successful, the local server selects an IP address pool based on the following precedence:

  1. If AAA specifies an IP address, the DHCP local server finds the address pool containing the address, then allocates that address.
  2. If AAA specifies an address pool name, the local server finds the pool with the matching name and allocates an address from that pool.
  3. The local server finds the address pool whose name matches the client's domain.
  4. The local server finds the address pool whose domain name matches the client's domain.
  5. The local server finds the address pool whose IP network matches the client's DHCP giaddr.
  6. The local server finds the address pool whose interface matches the interface on which the client's DHCP request was received.

Server Management Table

For each client that makes requests of the DHCP local server, the router keeps an entry in the server management table. The entry defines client-specific information and state information. The router uses this table to identify clients when it receives subsequent messages and to maintain the state of each client within the DHCP protocol. In addition, the table contains information that may be transferred to and from the SRC software.

DHCP Local Server Prerequisites

Before you configure DHCP local server, you need to configure interfaces. You can configure ATM or Ethernet interfaces for DHCP local server. These interfaces can be numbered or unnumbered. Because subscribers connect to the router from different subnetworks, you must configure an IP address for each subnetwork on the interface. This action provides connectivity between the subnetwork and the router.

To configure a numbered IP address for DHCP local server:

1. Select an ATM or Ethernet interface.
2. Assign the primary IP address for one subnetwork to this interface.
3. Assign secondary IP addresses for all other subnetworks to this interface.

To configure an unnumbered IP address for DHCP local server:

1. Specify a loopback interface.
2. Assign the primary IP address for one subnet to the loopback interface.
3. Assign secondary IP addresses for all other subnets to the loopback interface.
4. Select an ATM or Ethernet interface.
5. Configure an unnumbered IP address associated with the loopback interface on the ATM or Ethernet interface.

For information about defining IP addresses, see *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

DHCP Local Server Configuration Tasks

This section covers the configuration tasks for equal-access and standalone modes. Perform the appropriate procedure:

1. For both equal-access and standalone modes, configure the DHCP local server.

   See *Configuring AAA Authentication for DHCP Local Server Standalone Mode* in *Chapter 19, Configuring DHCP Local Server* for a sample configuration.

2. For standalone mode, optionally configure the router to use AAA authentication for DHCP requests from subscribers.

   See *Configuring AAA Authentication for DHCP Local Server Standalone Mode* in *Chapter 19, Configuring DHCP Local Server* for a sample configuration.

3. For non-PPP equal access, configure the router to work with the SRC software.

   See *Configuring the Router to Work with the SRC Software* in *Chapter 19, Configuring DHCP Local Server* for a sample configuration.

Chapter 19

Configuring DHCP Local Server

This chapter provides information for configuring the DHCP local server on the E-series router. This chapter contains the following sections:

Configuring the DHCP Local Server

This section describes how to configure the DHCP local server:

1. Enable the DHCP local server for either equal-access or standalone mode.

   host1(config)#**service dhcp-local equal-access**
   host1(config)#**service dhcp-local standalone**

2. (Optional) Specify the maximum number of IP addresses that the DHCP local server can supply to each VPI/VCI, VLAN, Ethernet subnetwork, or to a particular interface or subinterface. See *Limiting the Number of IP Addresses Supplied by DHCP Local Server* on page 406 for more information about limiting the number of IP addresses.

   host1(config)#**ip dhcp-local limit ethernet 6**

3. (Optional) Specify any addresses that the DHCP local server must not assign. See *Excluding IP Addresses from Address Pools* on page 407 for more information.

   host1(config)#**ip dhcp-local excluded-address 10.10.3.4**

4. (Optional) Enable general DHCP local server traps. See *Using SNMP Traps to Monitor DHCP Local Server Events* on page 409.

   host1(config)#**ip dhcp-local snmpTraps**

5. (Optional) Configure the DHCP local server to support the creation of dynamic subscriber interfaces built over dynamic VLANs that are based on the agent-circuit-id option (suboption 1) of the option 82 field in DHCP messages. See *Configuring DHCP Local Server to Support Creation of Dynamic Subscriber Interfaces* on page 407.

   host1(config)#**ip dhcp-local auto-configure agent-circuit-identifier**

6. (Optional) Specify that DHCP local server use an optional method to differentiate between clients with duplicate client IDs or hardware addresses. Any changes you make have no effect on currently bound clients. See *Differentiating Between Clients with the Same Client ID or Hardware Address* on page 407.

   host1(config)# **ip dhcp-local unique-client-ids**

7. Configure the DHCP local address pool that supplies IP addresses to subscribers who want to access a domain. See *Configuring DHCP Local Address Pools* on page 411 for more information about configuring address pools.

Limiting the Number of IP Addresses Supplied by DHCP Local Server

You can specify the maximum number of IP addresses that the DHCP local server can supply to each VPI/VCI, VLAN, Ethernet subnetwork, or to a particular interface or subinterface.

You can set global limits for a given interface type—all interfaces of that type that are subsequently created, whether dynamically or statically, inherit that limit value.

You can also set an individual interface limit for a specific interface and override the global limit configured for that interface type. For example, suppose the VLAN interface type limit is five. You can specify a limit of 10 for the VLAN interface FastEthernet 1/0.100. All other VLAN interfaces retain the global limit of five.

The global limits for interface types and the individual interface limits set on static interfaces are kept in NVS. These values are restored during a switchover or a reload.

When you assign an individual limit to a dynamic interface, that limit is in force only until either a switchover or reload takes place. After the switchover or reload, if the action that caused the dynamic interface to be created occurs again, a new dynamic interface is created. The new dynamic interface then inherits the limit set by the global values based on the type of interface that is created.

- Setting a global limit for an interface type:

  host1(config)#**ip dhcp-local limit ethernet 6**

- Setting a limit for a specific interface:

  host1(config)#**ip dhcp-local limit interface atm 3/1 15**

NOTE: Limits that you specify on dynamic interfaces are not restored after a switchover or reboot.

Excluding IP Addresses from Address Pools

You can use the **ip dhcp-local excluded-address** command to specify IP addresses that you do not want the DHCP local server to supply from the default address pool. You might exclude addresses if because those addresses are already used by devices on the subnetwork.

You can exclude a single IP address or a range of addresses. To exclude a range, you specify the start-of-range IP address and the end-of-range IP address.

- Excluding a specific IP address:

  host1(config)#**ip dhcp-local excluded-address 10.10.3.4**

- Excluding a range of IP addresses:

  host1(config)#**ip dhcp-local excluded-address 10.10.3.4 10.10.3.100**

Configuring DHCP Local Server to Support Creation of Dynamic Subscriber Interfaces

You can use the **ip dhcp-local auto-configure agent-circuit-identifier** command to configure the DHCP local server to support the creation of dynamic subscriber interfaces built over dynamic VLANs that are based on the agent-circuit-id option (suboption 1) of the option 82 field in DHCP messages.

- Use this command within a specific virtual router context.
- This command requires that the user's DHCP control traffic and data traffic traverse the same client-facing ingress port on the E-series router.

The use of the option 82 field enables you to stack an IP interface that is associated with a particular subscriber over a dynamically created VLAN; the VLAN is dynamically created based on the agent-circuit-id option (suboption 1) that is contained in the DHCP option 82 field.

For information about configuring agent-circuit-id–based dynamic VLAN subinterfaces, see *JUNOSe Link Layer Configuration Guide, Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

Differentiating Between Clients with the Same Client ID or Hardware Address

A JUNOSe software feature enables the DHCP local server to create unique client IDs to support roaming clients and to manage situations in which two clients in the network have the same hardware address.

NOTE: This feature replaces the previous router behavior for DHCP local server client roaming and duplicate address support. The **ip dhcp-local unique-client-ids** command replaces the **ip dhcp-local inhibit-roaming** command, which has been removed from the CLI and has no effect on the DHCP local server.

You can configure the method DHCP local server uses when the router receives a DISCOVER or REQUEST packet that contains a client ID or hardware address that matches the ID or address of a currently bound client on another subnet or subinterface.

In the default configuration, the DHCP local server uses the DHCP client's subnet or subinterface to differentiate duplicate clients and support client roaming. When a new client, with a duplicate ID or hardware address, requests an address lease, DHCP assigns that client a new address and lease—the existing client's lease is unchanged.

The following table describes how the DHCP local server differentiates between a new DHCP client with the same ID or hardware address as a currently bound DHCP client. The determination is based on whether the DHCP clients exist on the same or on different subnets and subinterfaces.

Location of DHCP Clients with Identical IDs or Addresses	How DHCP Local Server Differentiates Clients
On different subinterfaces in the same subnet	By unique subinterface
On the same subinterface in different subnets	By unique subnet
On different subinterfaces in different subnets	By unique subinterface and unique subnet
On the same subinterface in the same subnet	DHCP local server *cannot distinguish clients* with identical IDs or identical hardware addresses in this configuration

In the optional configuration, you use the **ip dhcp-local unique-client-ids** command to disable the use of the DHCP client's subnet or subinterface to differentiate between clients with duplicate client IDs or hardware addresses. When DHCP receives the request from a duplicate ID or address, DHCP terminates the address lease for the existing client and returns the address to its original address pool. DHCP then assigns a new address and lease to the new client.

We recommend that you enable the **ip dhcp-local unique-client-ids** command only when duplicate client IDs and hardware addresses do not exist in your network.

Logging Out DHCP Local Server Subscribers

You can use the **logout subscribers** command from Privileged Exec mode to log out DHCP local server subscribers. For example, you might use this feature if you want to force a user to request a new lease or if you want to recover functional resources. The **logout subscribers** command, unlike the **clear ip address binding** command (described in *Clearing an IP DHCP Local Server Binding* on page 409), does not terminate the subscriber's user session or management representation.

This command applies to DHCP local server local-access and standalone clients, as well as to PPP users. You can log out **all** subscribers, or log out subscribers by **username**, **domain**, **virtual-router**, or **port**.

Clearing an IP DHCP Local Server Binding

NOTE: This command is deprecated and might be removed completely in a future release. The function provided by this command has been replaced by the **dhcp delete-binding** command.

You can use the **clear ip dhcp-local binding** command to force the removal of a connected user's IP address lease and associated route configuration. Using this command enables you to:

- Recover functional resources from a user who has not explicitly terminated connectivity and whose lease is unexpired.
- Discontinue connectivity to a user, prompting or forcing the user to request a new lease in order to reestablish network connectivity.

Using SNMP Traps to Monitor DHCP Local Server Events

The DHCP local server supports configurable global SNMP traps that monitor events related to the DHCP local server and local SNMP traps that are related to address pool utilization.You use the **ip dhcp-local snmpTraps** command to enable the global SNMP traps for DHCP local server.

The DHCP local server's global SNMP trap generates severity level 1 (alert), 2 (critical), and 3 (error) events. This trap helps administrators monitor DHCP local server general health, error statistics, address lease status, and protocol events. The global SNMP trap generates a severity level 4 (warning) event when a duplicate MAC address is detected. The global SNMP trap information is captured in the dhcpLocalGeneral logging category.

SNMP also traps events related to address pool utilization. You use the **warning** command to define the maximum and minimum threshold values and the **snmpTrap** command to generate traps when utilization occurs above or below the defined values.

For linked or shared pools, SNMP treats the members of the pool as a group, and uses the values configured for the first pool in the chain as the group's threshold.

The address pool utilization SNMP trap information is captured in the dhcpLocalPool logging category.

NOTE: You must configure your SNMP management client to read the MIB objects, and your SNMP trap collector must be capable of decoding the new traps. For information about setting up SNMP, see *JUNOSe System Basics Configuration Guide, Chapter 4, Configuring SNMP*.

Using DHCP Local Server Event Logs

To troubleshoot and monitor your DHCP local server, use the following system event logs:

- dhcpLocalClients—DHCP local server client events and duplicate MAC address detection
- dhcpLocalGeneral—DHCP local server infrastructure-related events and number of client threshold events

NOTE: The dhcpLocalGeneral category replaces the dhcpLocalServerGeneral category.

- dhcpLocalHighAvailability—DHCP high availability events
- dhcpLocalPool—DHCP local address pool events, including normal, linked, and shared pools
- dhcpLocalProtocol—DHCP local server protocol events

See the *JUNOSe System Event Logging Reference Guide* for additional information about the DHCP local server logs.

Related Topics

- Clearing an IP DHCP Local Server Binding on page 409
- Configuring DHCP Local Address Pools on page 411
- Configuring AAA Authentication for DHCP Local Server Standalone Mode on page 415
- Configuring DHCP Local Server to Support Creation of Dynamic Subscriber Interfaces on page 407
- Differentiating Between Clients with the Same Client ID or Hardware Address on page 407
- Excluding IP Addresses from Address Pools on page 407
- Limiting the Number of IP Addresses Supplied by DHCP Local Server on page 406
- Logging Out DHCP Local Server Subscribers on page 408
- Using DHCP Local Server Event Logs on page 410
- *Using SNMP Traps to Monitor DHCP Local Server Events* on page 409
- **clear ip dhcp-local binding** command
- **dhcp delete-binding** command
- **ip dhcp-local auto-configure agent-circuit-identifier** command

- **ip dhcp-local excluded-address** command
- **ip dhcp-local limit** command
- **ip dhcp-local unique-client-ids** command
- **logout subscribers** command
- **service dhcp-local** command

Configuring DHCP Local Address Pools

This section describes how to configure DHCP local address pool. DHCP local server uses the address pool to supply IP addresses to subscribers who want to access a domain.

1. Specify the pool name and access DHCP Local Pool Configuration mode.

   ```
   host1(config)#ip dhcp-local pool ispBoston
   host1(config-dhcp-local)#
   ```

2. Specify the IP address of the router for the subscriber's computer to use for traffic destined for locations beyond the local subnetwork.

   ```
   host1(config-dhcp-local)#default-router 10.10.1.1
   ```

   The default router must be on the same subnetwork as the local server pool IP addresses that you configure with the **network** command.

   You specify the IP address of a primary server, and optionally, the IP address of a secondary server.

3. (Optional) Assign a DNS server to an address pool. Some DHCP clients request the DHCP local server to assign a DNS server.

   ```
   host1(config-dhcp-local)#dns-server 10.10.1.1
   ```

4. (Optional) Specify a domain name that can be returned to the subscriber if requested.

   ```
   host1(config-dhcp-local)#domain-name ispBoston
   ```

   The name of the domain must match the name you specified for the RADIUS vendor-specific attribute (VSA) and for authentication, authorization, accounting, and address assignment.

5. Specify the time period for which the supplied IP address is valid.

   ```
   host1(config-dhcp-local)#lease 0 0 24
   ```

   Specify the number of days, and optionally, the number of hours, minutes, and seconds. Use the keyword **infinite** to specify a lease that does not expire. The default lease time is 30 minutes.

6. (Optional) Link the DHCP local address pool being configured to another local address pool. See *Linking Local Address Pools* on page 413 for more information about linking local address pools.

   host1(config-dhcp-local)#**link ispChicago**

7. (Optional) Assign a NetBIOS server for subscribers. Some DHCP clients request the DHCP local server to assign a NetBIOS server.

   host1(config-dhcp-local)#**netbios-name-server 10.10.1.1 10.10.1.2**

   Specify the IP address of a primary server and, optionally, the address of a secondary server.

8. (Optional) Specify NetBIOS node type.

   host1(config-dhcp-local)#**netbios-node-type b-node**

   Specify one of the following types of NetBIOS nodes. By default, the node type is unspecified.

   - **b-node**—Broadcast
   - **p-node**—Peer-to-peer
   - **m-node**—Mixed
   - **h-node**—Hybrid

9. Specify the IP addresses that the DHCP local server can provide from an address pool.

   host1(config-dhcp-local)#**network 10.10.1.0 255.255.0.0**

   Use the **force** keyword with the **no** version of the command to delete the address pool even if the pool is in use.

10. For standalone mode, you can reserve an IP address for a specific MAC address.

    host1(config-dhcp-local)#**reserve 10.10.13.8 0090.1a10.0552**

11. For standalone mode, you can specify the DHCP server address that is sent to DHCP clients.

    host1(config-dhcp-local)#**server-address 10.10.20.0**

12. (Optional) Enable Simple Network Management Protocol (SNMP) traps for local address pool utilization, including normal, linked, and shared address pools. Traps are generated based on threshold values for utilization. You can define threshold values by using the **warning** command. See *Using SNMP Traps to Monitor DHCP Local Server Events* on page 409 for more information about SNMP and local address pools.

    host1(config-dhcp-local)#**snmpTrap**
    host1(config-dhcp-local)#**warning 50 40**

13. (Optional) Configure a grace period for address leases allocated from the current DHCP local address pool. Specify the number of days and, optionally, the number of hours, minutes, and seconds in the grace period.

    host1(config-dhcp-local)#**grace-period 0 12**

    This command applies only to address leases that expire. Use the **use-release-grace-period** command to also apply the configured grace period to the local pool addresses that are explicitly released by clients. See *Setting Grace Periods for Address Leases* on page 413 for more information about grace periods.

14. (Optional) Specify that the grace period is applied to addresses that have been explicitly released by clients. By default, the grace period is applied only to address leases that expire, not to addresses that have been released. See *Setting Grace Periods for Address Leases* on page 413 for more information about grace periods.

    host1(config-dhcp-local)#**use-release-grace-period**

Linking Local Address Pools

In both equal-access mode and standalone mode, you can link a DHCP local pool to another local pool. The linked pool serves as a backup pool. If no addresses are available in a pool, the DHCP local server attempts to allocate an address from the linked pool. The address pools that are linked are viewed as a group.

Setting Grace Periods for Address Leases

The JUNOSe software enables you to configure a grace period for a particular local address pool—the grace period is applied to all address leases associated with the address pool. The grace period is the amount of time that a client continues to retain its address lease after the lease expires or is released. An address cannot be assigned to any other client during the grace period. When the grace period expires, the address is released back to the address pool.

Grace periods help to ensure that a DHCP client retains its previously assigned IP address in situations that might normally cause a lease termination followed by a new address assignment. For example, if a client loses its lease due to a network disruption, the grace period enables the client to be reassigned the same address when the client requests an address after the network stabilizes. Grace periods are also useful during client reboots and in cases where a non-compliant or unreliable DHCP implementation triggers a lease renewal.

You configure a grace period for a local address pool. The grace period is immediately applied to all addresses that are allocated from the pool, including previously allocated addresses that are currently active—the new grace period takes precedence over a previously configured grace period for the address pool.

NOTE: Configuring a new grace period that is shorter than the address pool current grace period immediately terminates any existing address leases that are in the grace period state and that have already exceeded the length of the new grace period.

NOTE: An address continues to be counted against the address pool resources while in a grace period. For example, if the address pool is exhausted, a new address cannot be assigned to other clients.

Client address leases enter the grace period in two ways—the lease might expire or the address can be explicitly released by the client. In both cases the address remains unavailable to other clients and can only be reapplied to the original client during the grace period. The address is released back to the address pool if the grace period expires before the address is reapplied to the original client.

When you configure a grace period, by default it is applied to address leases that *expire*, but not to addresses that are *released* by clients. However, you can optionally apply the grace period to released addresses.

Related Topics

- Linking Local Address Pools on page 413
- Setting Grace Periods for Address Leases on page 413
- Using SNMP Traps to Monitor DHCP Local Server Events on page 409
- **default-router** command
- **dns-server** command
- **domain-name** command
- **grace-period** command
- **ip dhcp-local pool** command
- **lease** command
- **link** command
- **netbios-name-server**command
- **netbios-node-type** command
- **network** command
- **reserve** command

- **server-address** command
- **snmpTrap** command
- **use-release-grace-period** command
- **warning** command

Configuring AAA Authentication for DHCP Local Server Standalone Mode

The DHCP local server enables you to optionally configure AAA-based authentication of standalone mode DHCP clients. In addition to providing increased security, AAA authentication also provides RADIUS-based input to IP address pool selection for standalone mode clients. By default, clients are not authenticated in standalone mode.

Typically, an incoming DHCP client does not provide a username—therefore, the DHCP local server constructs a username based on the user's attachment parameters and optional DHCP parameters. AAA uses the constructed username to authenticate the incoming client and create the AAA subscriber record for the client. The information in the AAA subscriber record is then used to determine the IP address pool from which to assign the address for the DHCP client. You can include the following elements in the username:

Attachment Parameters	DHCP Parameters
domain	circuit ID
user prefix	circuit type
–	MAC address
–	option 82
–	virtual router name

NOTE: The nondomain portion of a constructed username must contain at least one character. Otherwise, the DHCP local server rejects the DHCP client without performing the AAA authentication request.

When using authentication, AAA accepts the DHCP client as a subscriber—this enables you to use **show** commands to monitor configuration information and statistics about the client. You can also use the **logout subscriber** command to manage subscribers.

To configure AAA-based authentication for DHCP local server standalone mode clients:

CAUTION: Configuring authentication on the DHCP local server requires that you first disable the DHCP local server for standalone mode. Doing so removes your entire DHCP local server configuration. Therefore, if you want to configure authentication, do so before you have otherwise configured the DHCP local server.

1. Disable the DHCP local server for standalone mode.

   host1(config)#**no service dhcp-local standalone**

2. Enable AAA-based authentication for DHCP local server standalone mode clients.

   host1(config)#**service dhcp-local standalone authenticate**

3. Specify the password. that authenticates a locally configured DHCP standalone mode client. In DHCP standalone mode, the password is presented to AAA in an authentication request.

   host1(config)#**ip dhcp-local auth password to4tooL8**

4. Specify the domain for a username that is locally configured for a DHCP standalone mode client. The locally configured username is presented to AAA in an authentication request.

   host1(config)#**ip dhcp-local auth domain ISP1.com**

5. Specify the user-prefix for a username that is locally configured for a DHCP standalone mode client. The locally configured username is presented to AAA in an authentication request.

   host1(config)#**ip dhcp-local auth user-prefix ERX4-Boston**

6. Include optional information as part of the locally configured username for a DHCP standalone mode client. The optional information becomes part of the AAA subscriber record, and is then used to determine the IP address pool from which to assign the address for the DHCP client.

   Use the following keywords to include specific information:

   - **circuit-identifier**—Specifies the circuit identifier of the interface on which the DHCP client's request was received.
   - **circuit-type**—Specifies the circuit type of the interface on which the DHCP client's request was received.
   - **mac-address**—Specifies the DHCP client's MAC address.
   - **option82**—Specifies the DHCP client's option 82 value.
   - **virtual-router-name**—Specifies the DHCP local server's virtual router name.

   host1(config)#**ip dhcp-local auth include virtual-router-name**
   host1(config)#**ip dhcp-local auth include circuit-type**
   host1(config)#**ip dhcp-local auth include circuit-identifier**

7. (Optional) Verify your authentication configuration.

```
host1(config)#show ip dhcp-local auth config

DHCP Local Server Authentication Configuration

User-Prefix          : ERX4-Boston
Domain               : ISP1.com
Password             : to4TooL8
Virtual Router       : included
Circuit Type         : included
Circuit ID           : included
MAC Address          : excluded
Option 82            : excluded
```

Related Topics

- **ip dhcp-local auth domain** command
- **ip dhcp-local auth include** command
- **ip dhcp-local auth password** command
- **ip dhcp-local auth user-prefix** command
- **service dhcp-local authenticate** command

Configuring the DHCPv6 Local Server

In addition to the embedded DHCP local server that is used for IP version 4 (IPv4) address support, E-series routers include an embedded DHCPv6 local server. This server enables the router to function as a server for the DHCP protocol for IP version 6 (IPv6). The DHCPv6 local server sends and receives packets via IPv6 and informs IPv6 of the routing requirements of the router clients.

The DHCPv6 local server provides the following IPv6 address support:

- Delegates IPv6 prefixes to client routers; each client can have one prefix; prefixes and DNS information can be locally configured or derived from RADIUS via AAA.
- Provides DNS server information to directly connected router clients.

NOTE: You must add a vendor-specific attribute to RADIUS to enable E-series routers to retrieve IPv6 Domain Name System (DNS) addresses.

Use the following steps to configure the DHCPv6 local server:

1. Enable the DHCPv6 local server.

   host1(config)#**service dhcpv6-local**

2. Specify the IPv6 prefix and lifetime that are to be delegated to the DHCPv6 client. The specified prefix is delegated by the DHCPv6 local server when requested by the client.

   host1(config-if)#**ipv6 dhcpv6-local delegated-prefix 2001:db8:17::/48 lifetime infinite**

   Use the **lifetime** keyword to specify the time period for which the prefix is valid. This lifetime overrides the default lifetime that is set in Global Configuration mode. If no lifetime is specified, the default lifetime is assigned.

   - Specify the number of days and, optionally, the number of hours, minutes, and seconds. You cannot specify a lifetime of zero (that is, you cannot set the days, hours, minutes, and seconds fields all to zero).
   - Use the keyword **infinite** to specify a lifetime that does not expire.

3. Specify the name of a DNS domain for DHCPv6 clients in the current virtual router to search. You can specify a maximum of four DNS domains for a DHCPv6 local server's search list.

   host1(config-if)#**ipv6 dhcpv6-local dns-domain-search xyzcorporation.com**
   host1(config-if)#**ipv6 dhcpv6-local dns-domain-search xyzcorp.com**

4. Specify the IPv6 address of the DNS server and to assign the server to the DHCPv6 clients in the current virtual router. Your can specify a maximum of four DNS servers.

   host1(config-if)#**ipv6 dhcpv6-local dns-server 2001:db8:18::**

5. Set the default lifetime for which a prefix delegated by this DHCPv6 local server is valid. This default is overridden by an interface-specific lifetime.

   host1(config-if)#**ipv6 dhcpv6-local prefix-lifetime infinite**

   - Specify the number of days and, optionally, the number of hours, minutes, and seconds. You cannot specify a lifetime of zero (that is, you cannot set the days, hours, minutes, and seconds fields all to zero).
   - Use the keyword **infinite** to specify a lifetime that does not expire.

Related Topics

- **ip dhcp-local auth domain** command
- **service dhcpv6-local** command
- **ipv6 dhcpv6-local delegated-prefix** command

- **ipv6 dhcpv6-local dns-domain-search** command
- **ipv6 dhcpv6-local dns-server** command
- **ipv6 dhcpv6-local prefix-lifetime** command

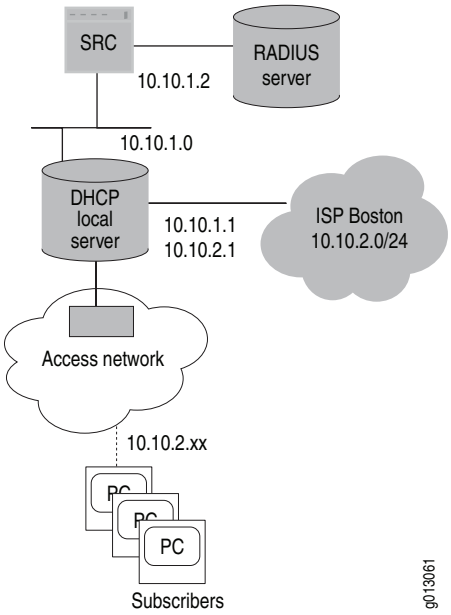
Configuring the Router to Work with the SRC Software

E-series routers have an embedded SRC client that interacts with the SRC software. For information about configuring the SRC client, see *Configuring the SRC Client* in *Chapter 1, Configuring Remote Access*.

Configuration Example

Figure 12 shows the scenario for this example. Subscribers obtain access to ISP Boston via a router. Subscribers log in through the SRC software, and a RADIUS server provides authentication.

Figure 12: Non-PPP Equal-Access Configuration Example



The following steps describe how to configure this scenario.

1. Configure interfaces on the router.

```
host1(config)#interface loopback 0
host1(config-if)#ip address 10.10.1.1 255.255.255.0
host1(config-if)#ip address 10.10.2.1 255.255.255.0 secondary
host1(config-if)#exit
host1(config)#interface fastEthernet 2/0
host1(config-if)#ip unnumbered loopback 0
```

2. Configure the parameters to enable the router to forward authentication requests to the RADIUS server.

   host1(config)#**radius authentication server 10.10.1.2**
   host1(config)#**udp-port 1645**
   host1(config)#**key radius**

3. Specify the authentication method.

   host1(config)#**aaa authentication ppp default radius**

   Or

   host1(config)#**aaa authentication ppp default none**

4. Enable the DHCP local server.

   host1(config)#**service dhcp-local**

5. Specify the IP addresses that are in use, so that the DHCP local server cannot assign these addresses.

   host1(config)#**ip dhcp-local excluded-address 10.10.1.1**
   host1(config)#**ip dhcp-local excluded-address 10.10.1.2**

6. Configure the DHCP local server to provide IP addresses to subscribers of ISP Boston.

   host1(config)**ip dhcp-local pool ispBoston**
   host1(config-dhcp-local)#**network 10.10.2.0 255.255.255.0**
   host1(config-dhcp-local)#**domain-name ispBoston**
   host1(config-dhcp-local)#**default-router 10.10.2.1**
   host1(config-dhcp-local)#**lease 0 0 10**
   host1(config-dhcp-local)#**ip dhcp-local limit atm 5**

7. Configure the SRC client.

   host1(config)#**sscc primary address 10.10.1.2 port 3310**
   host1(config)#**sscc enable**
   host1(config)#**sscc retryTimer 200**

Chapter 20

Configuring DHCP Relay

The Dynamic Host Configuration Protocol (DHCP) provides a mechanism through which computers using Transmission Control Protocol/IP (TCP/IP) can obtain protocol configuration parameters automatically from a DHCP server on the network.

The following sections describe how to configure your E-series router to provide DHCP support:

Configuring DHCP Relay and BOOTP Relay

The DHCP relay feature relays a request from a remote client to a DHCP server for an IP address. When the router receives a DHCP request from an IP client, it forwards the request to the DHCP server and passes the response back to the IP client.

Configuring DHCP relay also enables bootstrap protocol (BOOTP) relay. The router relays any BOOTP requests it receives to the same set of servers that you configured for DHCP relay. A DHCP server can respond to the BOOTP request only if it is also a BOOTP server. The router relays any BOOTP responses it receives to the originator of the BOOTP request. If you do not configure DHCP relay, then BOOTP relay is disabled.

The router must wait for an acknowledgment from the DHCP server that the assigned address has been accepted. The IP client must accept an IP address from one of the servers. When the DHCP server sends an acknowledgment message back to the DHCP client via the router, the router updates its routing table with the IP address of the client.

If a DHCP relay request is received on an unnumbered interface, the router determines the loopback address for that interface and passes that IP address to the server.

DHCP carries other important configuration parameters, such as the subnet mask, default router, and DNS server. You can also use the DHCP relay agent information option (option 82) to add information to the DHCP packets sent to DHCP servers—the additional information, in the form of suboptions to the option 82 value, helps you to manage the IP address and service level assignments granted to your subscribers. For example, you can add the E-series hostname or the virtual router name to the front of the Agent Circuit ID suboption (suboption 1) of the DHCP relay agent information option (option 82). See *Configuring Relay Agent Option 82 Information* on page 432.

Enabling DHCP Relay

You use the **set dhcp relay** command to create and enable DHCP relay in the current virtual router.

- Include the IP address variable to enable DHCP relay and BOOTP relay and to specify an IP address for the DHCP server. When you include the IP address of a DHCP server, the router adds the IP address to the list of DHCP servers (up to five) and forwards all request packets to all configured servers.

  Issuing this command also enables relay of BOOTP requests to the configured DHCP servers. If one of the DHCP servers is also a BOOTP server and responds, the router relays the response to the request originator.

  host1(config)#**set dhcp relay 192.168.29.10**

- Use the **no** version with an IP address to remove the specified DHCP server:

  host1(config)#**no set dhcp relay 192.168.29.25**

- Use this command without an IP address to create the DHCP relay independent of any DHCP servers. Use this version of the command when configuring support for DHCP vendor-option strings (option 60). For information about configuring option 60 support, see *Using Option 60 Strings to Forward Client Traffic to Specific DHCP Servers* on page 429.

  host1(config)#**set dhcp relay**

- Use the **no** version without specifying an IP address to explicitly delete the DHCP relay from the current virtual router.

  host1(config)#**no set dhcp relay**

Removing Access Routes from Routing Tables and NVS

You can remove existing access routes for an interface from routing tables and nonvolatile storage (NVS).

- To remove access routes:

  host1(config)#**set dhcp relay discard-access-routers**

NOTE: When this feature is configured, the client bypasses the DHCP relay component and communicates directly with the DHCP server to request address renewal or to release the address. The DHCP relay component has no role in determining when or whether to remove the installed host route.

Treating All Packets as Originating at Trusted Sources

By default, the DHCP relay treats all packets destined for DHCP servers as if the packets originated at an untrusted source; if the packets have a gateway IP address (giaddr) of 0 and if option 82 information is present, these packets are dropped.

- To enable the trust-all method on the DHCP relay:

  host1(config)#**set dhcp relay trust-all**

In the trust-all method, the DHCP relay treats the packets as if they are from trusted sources and forwards the packets to the DHCP server. When you enable this command:

- If the DHCP packets contain option 82 and a giaddr field of 0, the DHCP relay inserts its giaddr into the packets and then forwards the packets.
- If the DHCP relay is configured to add option 82, it does not add an additional option 82 if one is already present in the DHCP packets.

Assigning the Giaddr to Source IP Address

As a security measure, DHCP servers typically use the giaddr included in DHCP packets to ensure that the packets come from a recognized DHCP gateway. The servers verify that the giaddr in the DHCP packet matches the source IP address in the IP packet header. You can use the **set dhcp relay assign-giaddr-source-ip** command to specify that the DHCP relay and DHCP relay proxy assign the giaddr to the source IP packet header of packets they send to DHCP servers—the DHCP servers can then compare the giaddr in the IP packet header to the giaddr in the DHCP packets.

- To assign the giaddr to the source IP packet header:

  host1(config)#**set dhcp relay assign-giaddr-source-ip**

Protecting Against Spoofed Giaddr and Relay Agent Option Values

DHCP relay includes an override feature that provides enhanced security to protect against spoofed giaddr and relay agent option (option 82) values in packets destined for DHCP servers.

DHCP relay can detect spoofed giaddrs when the giaddr value is equal to a local IP address on which the DHCP relay can be accessed; otherwise, DHCP relay does not detect spoofed giaddrs. Also, DHCP relay does not detect spoofed relay agent option values.

Spoofed giaddrs are a concern when the DHCP relay is used if the giaddr value in received DHCP packets is different from the local IP address on which the DHCP relay is accessed. In this situation, DHCP relay always honors the giaddr. To configure DHCP relay to override all giaddrs (including valid giaddrs) that are received from downstream network elements, use the **set dhcp relay override** command with the **giaddr** keyword. DHCP relay then takes control of the client, adding its own giaddr to the packets before forwarding the packets to the DHCP server.

Spoofed relay agent options are a concern if the giaddr is not null, or if it is null and the DHCP relay is operating in the trust-all method. In these two situations, DHCP relay always honors the relay agent option value in received DHCP packets.

- To protect against spoofed giaddrs and relay agent option values:

  host1(config)#**set dhcp relay override agent-option**

  DHCP relay then overrides all relay agent option values that are received from downstream network elements, performing one of the following actions:

  - If the DHCP relay is configured to add relay agent option 82 to the packets, it clears the existing option 82 values and inserts the new values.
  - If the DHCP relay is not configured to add relay agent option 82, it clears the existing option values but does not add any new values.

Using the Broadcast Flag Setting to Control Transmission of DHCP Reply Packets

Each DHCP request packet includes a broadcast flag that, if set, specifies how to transmit DHCP Offer reply packets and DHCP ACK and NAK reply packets to DHCP clients during the discovery process. To configure DHCP relay and DHCP relay proxy to use the setting of the broadcast flag to control the transmission of DHCP Offer, DHCP ACK, and DHCP NAK reply packets, use the **set dhcp relay broadcast-flag-replies** command from Global Configuration mode.

When you issue the **set dhcp relay broadcast-flag-replies** command, the method that DHCP relay and DHCP relay proxy use to transmit DHCP Offer reply packets and ACK and NAK reply packets depends on whether the broadcast flag in the DHCP request packet is set or not set, as follows:

- If the broadcast flag is set in the DHCP request packet, using the **set dhcp relay broadcast-flag-replies** command causes DHCP relay and DHCP relay proxy to broadcast DHCP reply packets to clients.
- If the broadcast flag is not set in the DHCP request packet, using the **set dhcp relay broadcast-flag-replies** command causes DHCP relay and DHCP relay proxy to use the layer 2 unicast transmission method to send DHCP reply packets using the client's layer 2 (MAC) address and layer 3 (IP) unicast address.

There are exceptions to this behavior for DHCP relay proxy when the DHCP client is already bound to an IP address or is renewing the lease on its IP address. For information, see *Behavior for Bound Clients and Address Renewals* on page 447.

To display whether support for broadcast flag replies is currently on or off on the router, use the **show dhcp relay** command. For information, see *Chapter 22, Monitoring and Troubleshooting DHCP*.

To troubleshoot applications that use this feature, you can use the dhcpCapture system event log category. For information about how to log system events, see *JUNOSe System Event Logging Reference Guide, Chapter 1, System Logging Overview*.

Interaction with Layer 2 Unicast Transmission Method

As described in *Configuring Layer 2 Unicast Transmission Method for Reply Packets to DHCP Clients* on page 428, you can use the **set dhcp relay layer2-unicast-replies** command to configure DHCP relay and DHCP relay proxy to use the layer 2 unicast and layer3 broadcast transmission method to send DHCP Offer reply packets and DHCP ACK and NAK reply packets to clients.

The **set dhcp relay broadcast-flag-replies** command and the **set dhcp relay layer2-unicast-replies** command are mutually exclusive. If you attempt to issue the **set dhcp relay broadcast-flag-replies** command when the **set dhcp relay layer2-unicast-replies** command is already in effect, the operation fails and the router displays the following message:

```
% layer2-unicast-replies and broadcast-flag-replies are mutually exclusive
```

If this message appears, you must first issue the **no set dhcp relay layer2-unicast-replies** command to disable layer 2 unicast replies, and then issue the **set dhcp relay broadcast-flag-replies** command again to enable broadcast flag replies.

Table 96 summarizes how the configuration of the **set dhcp relay broadcast-flag-replies** command and the **set dhcp relay layer2-unicast-replies** command interacts with the setting of the broadcast flag in DHCP request packets to control how the router transmits DHCP reply packets to clients during the discovery process. Because these commands are mutually exclusive, broadcast flag replies and layer 2 unicast replies cannot both be enabled on the router at the same time.

Table 96: Router Configuration and Transmission of DHCP Reply Packets

Broadcast Flag Replies	Layer 2 Unicast Replies	Router Behavior if Broadcast Flag Set	Router Behavior if Broadcast Flag Not Set
Enabled (on)	Disabled (off)	DHCP relay and DHCP relay proxy broadcast DHCP reply packets to clients.	DHCP relay and DHCP relay proxy use layer 2 unicast and layer 3 unicast transmission to send DHCP reply packets to clients.
Disabled (off)	Enabled (on)	DHCP relay and DHCP relay proxy use layer 2 unicast and layer 3 broadcast transmission to send DHCP reply packets to clients.	DHCP relay and DHCP relay proxy use layer 2 unicast and layer 3 broadcast transmission to send DHCP reply packets to clients.

Table 96: Router Configuration and Transmission of DHCP Reply Packets (continued)

Broadcast Flag Replies	Layer 2 Unicast Replies	Router Behavior if Broadcast Flag Set	Router Behavior if Broadcast Flag Not Set
Disabled (off)	Disabled (off)	DHCP relay and DHCP relay proxy broadcast DHCP reply packets to clients. For information about exceptions to this behavior for DHCP relay proxy, see *Behavior for Bound Clients and Address Renewals* on page 447.	DHCP relay and DHCP relay proxy broadcast DHCP reply packets to clients. For information about exceptions to this behavior for DHCP relay proxy, see *Behavior for Bound Clients and Address Renewals* on page 447.

Preventing DHCP Relay from Installing Host Routes by Default

The Address Resolution Protocol (ARP) performs spoof checking on all incoming ARP requests by default. For each incoming packet, ARP does a route lookup on the source IP address to determine the interface on which that IP address was routed. ARP then verifies that the interface on which the packet was received matches the routed interface. If the interface on which the packet was received does not match the routed interface, the router drops the packet.

When you configure applications such as DHCP relay that automatically install routes, you must ensure that the routes are correctly installed for your configuration. DHCP relay installs host routes by default, which is required in certain configurations to enable address renewals from the DHCP server to work properly. However, the default installation of host routes might cause a conflict when you configure DHCP relay with static subscriber interfaces. To avoid these configuration conflicts, use the **set dhcp relay inhibit-access-route-creation** command to prevent DHCP relay from installing host routes by default.

Configuration Example—Preventing Installation of Host Routes

This example describes a sample procedure for configuring multiple subscribers over a particular static subscriber interface (ip53001 in this example)—you might use commands similar to the following to create demultiplexer table entries and a subnet route that points to the static subscriber interface.

In the example, the host routes are associated with the primary IP interface on Gigabit Ethernet 1/0. Because the host routes are statically configured with the subscriber interface, there is no need for the router to install DHCP host routes. Therefore, in step 7, the **set dhcp relay inhibit-access-route-creation** command is used to prevent DHCP relay from installing host routes.

1. Create a shared IP interface.

   host1(config)#**interface ip ip53001**

2. Associate the shared IP interface with a static layer 2 interface.

   host1(config-if)#**ip share-interface gigabitEthernet 1/0**

3. Make the shared interface an unnumbered interface.

   host1(config-if)#**ip unnumbered loopback 53**

4. Specify the source addresses that the subscriber interface uses to demultiplex traffic.

   host1(config-if)#**ip source-prefix 10.10.10.0 255.255.255.252**

5. Exit Interface Configuration mode.

   host1(config-if)#**exit**

6. Create a static route that sends traffic for destination address 10.10.10.0 to subscriber interface ip53001.

   host1(config)#**ip route 10.10.10.0 255.255.255.252 ip ip53001**

7. Prevent DHCP relay from installing host routes—this avoids a conflict that can cause undesirable ARP behavior.

   host1(config)#**set dhcp relay inhibit-access-route-creation**

In the example, if you do not prevent DHCP relay from installing host routes, the ARP spoof-checking mechanism associates the ARP traffic with the primary IP interface (Gigabit Ethernet 1/0), although packets actually arrive on the subscriber interface (ip53001), causing the router to detect a spoof and drop the packet.

Including Relay Agent Option Values in the PPPoE Remote Circuit ID

You can enable the router to capture and format a vendor-specific tag containing a PPPoE remote circuit ID value transmitted from a digital subscriber line access multiplexer (DSLAM) device. The router can then send this value to a Remote Authentication Dial-In User Service (RADIUS) server or to a Layer 2 Tunneling Protocol (L2TP) network server (LNS) to uniquely identify subscriber locations.

By default, the router formats the captured PPPoE remote circuit ID to include only the agent-circuit-id suboption (suboption 1) of the DHCP relay agent information option (option 82). You can use the **radius remote-circuit-id-format** command to configure the following nondefault formats for the PPPoE remote circuit ID value:

- Include either or both of the agent-circuit-id (suboption 1) and agent-remote-id (suboption 2) suboptions of the DHCP relay agent information option, with or without the NAS-Identifier [32] RADIUS attribute.

- Append the agent-circuit-id suboption value to an interface specifier that is consistent with the recommended format in the DSL Forum Technical Report (TR)-101—Migration to Ethernet-Based DSL Aggregation (April 2006).

For information about configuring the PPPoE remote circuit ID, see *Using the PPPoE Remote Circuit ID to Identify Subscribers* and *Configuring PPPoE Remote Circuit ID Capture* in *JUNOSe Link Layer Configuration Guide, Chapter 10, Configuring Point-to-Point Protocol over Ethernet*.

Using the Giaddr to Identify the Primary Interface for Dynamic Subscriber Interfaces

When creating dynamic subscriber interfaces, the router builds the dynamic interfaces on the associated primary interface. By default, the router identifies the primary interface based on the interface on which DHCP client discover packets are received. The router then builds all dynamic interfaces on that primary interface.

In some cases you might want more control over the determination of the primary interface and you might not want to use the primary interface that is determined by the default behavior. The JUNOSe software enables you to configure DHCP relay to use information in the giaddr in DHCP ACK messages to specify which interface is to be used as the primary interface. This capability allows you to build dynamic interfaces on the primary interface of your choice.

- To use information in the giaddr to identify the primary interface for dynamic subscriber interfaces:

  host1(config)#**set dhcp relay giaddr-selects-interface**

Configuring Layer 2 Unicast Transmission Method for Reply Packets to DHCP Clients

By default, DHCP relay and relay proxy broadcast DHCP Offer reply packets and DHCP ACK and NAK reply packets to DHCP clients during the discovery process. In some environments, this default broadcast method might be a security concern because all clients can receive packets intended for all other clients.

You use the **set dhcp relay layer2-unicast-replies** command in Global Configuration mode to configure the optional layer 2 unicast and layer 3 broadcast transmission method for DHCP relay and DHCP relay proxy. This method uses the client's layer 2 (MAC) address and layer 3 (IP) broadcast address to provide secure transmission of DHCP Offer reply packets and ACK and NAK reply packets. The optional layer 2 unicast method enables reply packets to be broadcast through the layer 3 network but received only by the specified client.

There are exceptions to this behavior for DHCP relay proxy when the DHCP client is already bound to an IP address or is renewing the lease on its IP address. For information, see *Behavior for Bound Clients and Address Renewals* on page 447.

To display whether the layer 2 unicast method is currently on or off on the router, use the **show dhcp relay** command. For information, see *Chapter 22, Monitoring and Troubleshooting DHCP*.

The dhcpRelayGeneral logging event category uses the debug severity level to log DHCP reply packets that are transmitted to clients using a layer 2 unicast address and a layer 3 broadcast address.

The **set dhcp relay broadcast-flag-replies** command configures the router to use the setting of the broadcast flag in DHCP request packets to control the transmission of DHCP reply packets. The **set dhcp relay layer2-unicast-replies** command and the **set dhcp relay broadcast-flag-replies** command are mutually exclusive. For more information, see *Interaction with Layer 2 Unicast Transmission Method* on page 425.

NOTE: When you enable the layer 2 unicast transmission feature, the DHCP relay and DHCP relay proxy instance must be the next hop from the DHCP clients. Otherwise, the DHCP reply packets might be discarded.

The layer 2 unicast transmission method is not supported on non-ASIC line modules.

- To configure the optional broadcast transmission method:

  host1(config)#**set dhcp relay layer2-unicast-replies**

Using Option 60 Strings to Forward Client Traffic to Specific DHCP Servers

The DHCP functionality supports the DHCP vendor class identifier option (option 60). This support allows DHCP relay to compare option 60 strings in received DHCP client packets against strings that you configure on the router. You can use the DHCP relay option 60 feature when providing converged services in your network environment—option 60 support enables DHCP relay to direct client traffic to the specific DHCP server (the vendor-option server) that provides the service that the client requires. Or, as another option, you can configure option 60 strings to direct traffic to the DHCP local server in the current virtual router.

For example, you might have an environment in which some DHCP clients require only Internet access, while other clients require IPTV service. The clients that need Internet access get their addresses assigned by the DHCP local server on the E-series router (in equal-access mode). Clients requiring IPTV must be relayed to a specific DHCP server that provides the service. To support both types of clients, you configure two option 60 strings on the DHCP relay. Now, when any DHCP client packets are received with option 60 strings configured, the strings are matched against all strings configured on the DHCP relay. If the client string matches the first string you configured, that client is directed to the DHCP local server and gains Internet access. Client traffic with an option 60 string that matches your second string is relayed to the DHCP server that provides the IPTV service. In addition, you can configure a default action, which DHCP relay performs when a client option 60 string does not match any strings you have configured—for example, you might specify that all clients with non-matching strings be dropped.

You use the **set dhcp vendor-option** command to configure vendor-option (option 60) strings to control DHCP client traffic Create DHCP vendor-option servers by configuring DHCP relay to match DHCP option 60 strings and to specify what action to use for the traffic.Use the following guidelines when configuring the **set dhcp vendor-option** command:

- Use the **equals** or **starts-with** keywords to specify a unique string to match, and to configure the action to take for traffic with a matching string:
  - **equals**—The DHCP client string is an exact match of the specified string
  - **starts-width**—The DHCP client string is a partial match, from left-to-right, of the specified string. For example, a client string of **day** matches a **starts-width** configured string of **daytime**.
- Use the following keywords to configure actions for matching strings:
  - **local-server**—Forward packets to the DHCP local server
  - **relay**—Forward packets to the DHCP server with the specified IP address
- Use the **default** keyword to set the default action to take when the option 60 string does not match a configured vendor-option string. Use the following keywords to configure actions for nonmatching strings:
  - **drop**—Discard traffic
  - **local-server**—Forward packets to the DHCP local server
  - **proxy-client**—Forward traffic to the DHCP proxy client server
  - **relay**—Forward packets to the DHCP server with the specified IP address
  - **relay-server-list**—Forward traffic to all non-vendor option DHCP servers. The relay-server-list consists of all non-vendor option servers. Non-vendor option servers are those servers that are configured with the **set dhcp relay** command but not with the **set dhcp vendor-option** command.
  - When you configure the first DHCP vendor-option and no default action is specified for a configured DHCP application, the router chooses the default action according to the preference of the DCHP applications. The order of preference from first to last is DHCP local server, DHCP relay, and DHCP proxy client.

You can map multiple strings to the same DHCP server, and you can map a single string to multiple servers. However, mapping one string to more than five DHCP vendor-option servers might impact performance.

You can configure a maximum of 100 option 60 strings per DHCP relay. Strings can contain a maximum of 254 characters.

Client packets that have option 60 configured but have no string specified (a string of 0 length) are treated as nonmatching strings and handled accordingly.

- To configure an exact match:

  host1(config)#**set dhcp vendor-option equals myword relay 192.168.7.7**

- To configure a partial match:

  host1(config)#**set dhcp vendor-option starts-with abcd local-server**

- To configure the default action:

  host1(config)#**set dhcp vendor-option default drop**

- To remove a configuration:

  host1(config)#**no set dhcp vendor-option starts-with abcd local-server**

Configuration Example—Using DHCP Relay Option 60 to Specify Traffic Forwarding

You use the DHCP relay option 60 feature to specify the action performed on DHCP client traffic. The DHCP relay uses the option 60 string in the client traffic to determine what action to take with the incoming traffic.

The following example describes a sample procedure that creates three actions for incoming DHCP client traffic, depending on the traffic's option 60 string.

1. Enable the DHCP relay. Do not specify an IP address when you configure DHCP relay to support vendor-option strings.

   host1(config)#**set dhcp relay**

2. Configure the action DHCP relay takes when the incoming traffic has an exact option 60 string of myword. DHCP relay forwards this traffic to the DHCP server with an IP address of 192.168.7.7.

   host1(config)#**set dhcp vendor-option equals myword relay 192.168.7.7**

3. Configure the action DHCP relay takes when the incoming traffic has a partial match, from left-to-right, with an option 60 string you have configured. For this command, matching strings include a, ab, abc, and abcd. DHCP relay forwards matching traffic to the DHCP server with IP address 192.168.15.2.

   host1(config)#**set dhcp vendor-option starts-with abcd relay 192.168.15.2**

4. Configure the default option 60 action. DHCP relay takes this action when the incoming traffic has an option 60 string that does not match any of the option 60 strings that you have configured. In this example, the traffic is sent to the DHCP local server.

   host1(config)#**set dhcp vendor-option default local-server**

5. (Optional) View your DHCP relay vendor-option configuration.

```
host1(config)#run show dhcp vendor-option
Codes:
 *       - the configured vendor-string is an exact-match
 default - all DHCP client packets not matching a configured vendor-string
 implied - the DHCP application is configured but has not been enabled
           with the vendor-option command
 drop    - the DHCP application responsible for the action has not been
           configured yet therefore all packets for this application
           will be dropped
 Total 3 entries.
         Vendor-option                          Action
------------------------------- ----------------------------------------
abcd                            relay to 192.168.15.2 (rx: 0)
default(*)                      local-server (rx: 0, no-match: 0)
myword(*)                       relay to 192.168.7.7 (rx: 0)
```

Relaying DHCP Packets that Originate from a Cable Modem

You can use the DHCP vendor class identifier option (option 60) to configure DHCP relay to relay DHCP packets that originate from a cable modem to an external DHCP server that provides the cable modem with the configuration it requests.

Configure the vendor class identifier option to match the string used by cable modems—DHCP relay then forwards the packets to each DHCP server that you configured with the **set dhcp vendor-option** command (these servers are also considered to be cable-modem DHCP servers).

- To relay DHCP packets from a cable modem:

  host1(config)#**set dhcp relay**
  host1(config)#**service dhcp-local equal-access**
  host1(config)#**set dhcp vendor-option equals docsis relay 192.168.1.1**
  host1(config)#**set dhcp vendor-option equals cablemodem relay 192.168.1.1**

  Use the **show dhcp summary** and **show dhcp vendor-option** commands to display information about the cable modem DHCP relay configuration. See *Chapter 22, Monitoring and Troubleshooting DHCP*.

Configuring Relay Agent Option 82 Information

You can specify the type the relay agent option 82 information that the router adds to DHCP packets before it relays the packets to the DHCP server. You can use one of the following keywords to add either the hostname or virtual router name to the front of the Circuit-Id field or to strip the subinterface ID from the Interface-Id field:

- **hostname**—Adds the router's hostname to the front of the Circuit-Id field; a colon separates the hostname from the circuit information

- **vrname**—Adds the router's virtual router name to the front of the Circuit-Id field; a colon separates the virtual router name from the circuit information

- Use the **exclude-subinterface-id** to strip the subinterface ID from the Interface-Id field. When the interface ID is constructed, it contains the slot/port numbers, the subinterface ID, and the VPI/VCI for ATM interfaces or the VLAN ID for Ethernet interfaces. Use this keyword to remove the subinterface ID from the Interface-Id field.

The **hostname** and **vrname** keywords are a toggle; that is, specifying either hostname or virtual router name turns off the other selection.

- To configure the relay agent option 82 information:

  host1(config)#**set dhcp relay options hostname**

Preventing Option 82 Information from Being Stripped from Trusted Client Packets

You can configure DHCP relay or DHCP relay proxy to preserve option 82 information for trusted clients. This ensures that DHCP relay and DHCP relay proxy prevent option 82 information from being stripped off packets destined for a trusted client. A trusted client has a giaddr value of 0. If DHCP relay is configured not to remove option 82 and the giaddr field is 0, option 82 information remains in the packets.

- To prevent the option 82 information from being removed from packets destined for a trusted client:

  host1(config)#**set dhcp relay preserve-trusted-client-option**

Configuring Relay Agent Information Option (Option 82) Suboption Values

The DHCP relay agent information option (option 82) enables you to include additional useful information in the client-originated DHCP packets that the DHCP relay forwards to a DHCP server.

When the DHCP relay agent information option is enabled, the DHCP relay adds the option 82 information to packets it receives from clients, then forwards the packets to the DHCP server. The DHCP server uses the option 82 information to decide which IP address to assign to the client—the DHCP server might also use information in the option 82 field for additional purposes, such as determining which services to grant to the client. The DHCP server sends its reply back to the DHCP relay, which removes the option 82 information field from the message, and then forwards the packet to the client.

The option 82 information is made up of a sequence of suboptions. JUNOSe software supports the following DHCP relay agent information suboptions.

- Agent Circuit ID (suboption 1)—An ASCII string that identifies the interface on which a client DHCP packet is received.

- Agent Remote ID (suboption 2)—An ASCII string assigned by the relay agent that securely identifies the client.

- Vendor-Specific (suboption 9)—The JUNOSe software data field, which contains the Internet Assigned Numbers Authority (IANA) enterprise number (4874) used by JUNOSe software and either or both the layer 2 circuit ID and the user packet class.

  - Layer 2 Circuit ID (type 1)—The hexadecimal representation of the layer 2 identifier in the Agent Circuit ID (suboption 1) value (for example, the ATM VPI/VCI or Ethernet SVLAN/VLAN ID.) You can configure this suboption type without the Agent Circuit ID.

  - User Packet Class (type 2)—The hexadecimal representation of the user packet class field, whose value is assigned by the layer 2 policy application. The layer 2 policy application can be used to map the DHCP packet or message IEEE 802.1p value to the user packet class field. See the *JUNOSe Policy Management Configuration Guide* for information about layer 2 policies.

The Agent Circuit ID suboption (suboption 1) and the Agent Remote ID suboption (suboption 2) are typically determined by the client network access device and depend on the network configuration. The Vendor-Specific suboption (suboption 9) is more flexible and can be used by administrators to associate specific data with the DHCP messages relayed between the DHCP relay and the DHCP server. For example the Vendor-Specific suboption can include the client's IEEE 802.1p value, which identifies the client's user priority.

NOTE: The DHCP relay agent replaces any existing Vendor-Specific value in the client packet with the relay agent's value.

The JUNOSe software provides two commands that you can use to configure DHCP relay agent information suboptions.

- The **set dhcp relay agent sub-option** command—Enables you to configure option 82 to include any combination of the supported suboptions, including the Vendor-Specific suboption.

- The **set dhcp relay agent** command—Enables you to configure option 82 to include either or both the Agent Circuit ID suboption (suboption 1) and Agent Remote ID suboption (suboption 2). The command does not support the Vendor-Specific suboption (suboption 9).

NOTE: The **set dhcp relay agent** command is a legacy command, which JUNOSe software continues to support to provide backward-compatibility for existing scripts. We recommend that all new configurations use the **dhcp relay agent sub-option** command.

The **set dhcp relay agent sub-option** command enables you to manage specific option 82 suboptions without impacting the configuration of other suboptions. The legacy **set dhcp relay agent** command, however, changes the configuration of suboptions in some cases.

Table 97 indicates the effect each command has on enabling or disabling relay agent information suboptions.

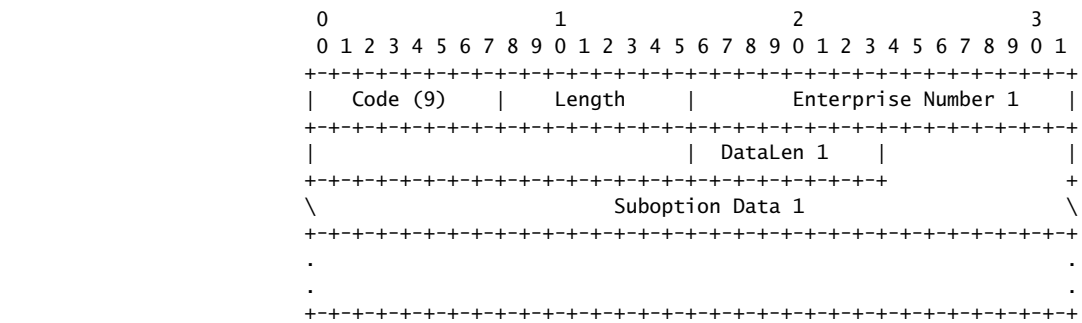
Table 97: Effect of Commands on Option 82 Suboption Settings

Command	Suboption and Status		
	Agent Circuit ID	**Agent Remote ID**	**Vendor-Specific**
set dhcp relay agent sub-option circuit-id	Enable	No change	No change
set dhcp relay agent sub-option remote-id	No change	Enable	No change
set dhcp relay agent sub-option vendor-specific *suboption-type*	No change	No change	Enable specified suboption type
no set dhcp relay agent sub-option circuit-id	Disable	No change	No change
no set dhcp relay agent sub-option remote-id	No change	Disable	No change
no set dhcp relay agent sub-option vendor-specific *suboption-type*	No change	No change	Disable specified suboption type
set dhcp relay agent	Enable	Enable	Not supported
set dhcp relay agent circuit-id-only	Enable	Disable	Not supported
set dhcp relay agent remote-id-only	Disable	Enable	Not supported
no set dhcp relay agent	Disable	Disable	Disable

Format of the JUNOSe Data Field in the Vendor-Specific Suboption for Option 82

RFC 4243 describes support for data fields from multiple vendors in the Vendor-Specific suboption for option 82. The JUNOSe software DHCP relay agent, however, supports only the JUNOSe software data field.

RFC 4243 supports the following format of the Vendor-Specific suboption:



The JUNOSe software data field appears after the JUNOSe software enterprise number and data length fields in the Vendor-Specific suboption. The format of the JUNOSe data field is a sequence of type/length/value (TLV) tuples. The type field and length field (the length of the following value field) are each 1 byte in size. The JUNOSe data length field specifies the total length of all TLV tuples. The JUNOSe software enterprise number is 4874 (0x130a.)

The format of the Layer 2 Circuit ID type field (type 1) is hexadecimal. The data field length of a normal non-stacked VLAN is 2 bytes, with the VLAN ID occupying the 12 low-order bits of the value; the 4 high-order bits are 0. The data field length of a stacked VLAN is 4 bytes, with the SVLAN ID occupying the 12 low-order bits of the 2 high-order bytes, and the VLAN ID occupying the 12 low-order bits of the 2 low-order bytes; the unused bits are 0. The data field length of a VPI/VCI is 4 bytes, with the VPI occupying the 8 to 10 low-order bits of the 2 high-order bytes, and the VCI occupying the 16 bits of the 2 low-order bytes; the unused bits are 0.

The format of the UPC data field (type 2) is hexadecimal; its data field length is 1 byte, with the UPC occupying the 4 low-order bits of the value; the 4 high-order bits are 0.

Example 1—The Vendor-Specific suboption for a VLAN ID of 2468 (0x09a4) and a UPC of 5 is formatted as follows:

```
09 0c 00 00 13 0a 07 01 02 09 a4 02 01 05
|  |  |           |  |  |  |     |  |  |
|  |  |           |  |  |  |     |  |  UPC val: 5
|  |  |           |  |  |  |     |  UPC len: 1 byte
|  |  |           |  |  |  |     UPC type: 2
|  |  |           |  |  |  L2 Circuit ID val: 09 a4
|  |  |           |  |  L2 Circuit ID len: 2 bytes
|  |  |           |  L2 Circuit ID type: 1
|  |  |           JUNOSe data len: 7 bytes
|  |  JUNOSe IANA: 13 0a
|  subopt 9 len: 12 bytes
subopt code: 9
```

Example 2—The Vendor-Specific suboption for a VLAN ID of 135-2468 (0x87-0x09a4, format <SVLAN ID>-<VLAN ID>) and a UPC of 5 is formatted as follows:

```
09 0e 00 00 13 0a 09 01 04 00 87 09 a4 02 01 05
|  |  |           |  |  |  |           |  |  |
|  |  |           |  |  |  |           |  |  UPC val: 5
|  |  |           |  |  |  |           |  UPC len: 1 byte
|  |  |           |  |  |  |           UPC type: 2
|  |  |           |  |  |  L2 Circuit ID val: 00 87 09 a4
|  |  |           |  |  L2 Circuit ID len: 4 bytes
|  |  |           |  L2 Circuit ID type: 1
|  |  |           JUNOSe data len: 9 bytes
|  |  JUNOSe IANA: 13 0a
|  subopt 9 len: 14 bytes
subopt code: 9
```

Example 3—The Vendor-Specific suboption for a VPI/VCI of 123.45678 (0x7b.0xb26e, format <VPI>.<VCI>) and a UPC of 5 is formatted as follows:

```
09 0e 00 00 13 0a 09 01 04 00 7b b2 6e 02 01 05
|  |  |           |  |  |  |           |  |  |
|  |  |           |  |  |  |           |  |  UPC val: 5
|  |  |           |  |  |  |           |  UPC len: 1 byte
|  |  |           |  |  |  |          UPC type: 2
|  |  |           |  |  |  L2 Circuit ID val: 00 7b b2 6e
|  |  |           |  |  L2 Circuit ID len: 4 bytes
|  |  |           |  L2 Circuit ID type: 1
|  |  |          JUNOSe data len: 9 bytes
|  |  JUNOSe IANA: 13 0a
|  subopt 9 len: 14 bytes
subopt code: 9
```

Using the set dhcp relay agent sub-option Command to Enable Option 82 Suboption Support

NOTE: We recommend that you use the **set dhcp relay agent sub-option** command for new option 82 suboption configurations. However, JUNOSe software continues to support the **set dhcp relay agent** command, with option 82 suboptions, to provide backward-compatibility for existing scripts.

You use the **set dhcp relay agent sub-option** command to enable support for a specific DHCP relay agent option 82 suboption—Agent Circuit ID (suboption 1), Agent Remote ID (suboption 2), and Vendor-Specific (suboption 9). When you issue this command, the router adds DHCP relay agent information suboption 1 to every packet it relays from a DHCP client to a DHCP server. The Agent Circuit ID suboption identifies the interface on which DHCP packets are received. When the packets are received on a LAG interface, the router clearly identifies the interface.

The suboptions include information from the DHCP relay agent that the DHCP server can use to implement parameter assignment policies. The DHCP server echoes the suboptions when it replies to the DHCP client, but the DHCP relay strips the suboptions before relaying the packets to the client.

The Agent Circuit ID suboption identifies the interface on which the DHCP packets are received. This suboption contains the following information, based on interface type:

- ATM interface

  [<hostname>|<vrname>:]<interface type> <slot>/<port>[.<sub-if>]:<vpi>.<vci>

  Examples:

  atm 4/1.2:0.101
  relayVr:atm 4/1:0.101
  bostonHost:atm 4/1.2:0.101

- Ethernet interface

  [<hostname>|<vrname>:]<interface type> <slot>/<port>

  Examples:

  fastEthernet 1/2
  relayVr:fastEthernet 1/2
  bostonHost:fastEthernet 1/2

- Ethernet interface with VLAN

  [<hostname>|<vrname>:]<interface type> <slot>/<port>[.<sub-if>]:<vlan id>

  Examples:

  fastEthernet 1/2.3:4
  relayVr:fastEthernet 1/2:4
  bostonHost:fastEthernet 1/2.3:4

- Ethernet interface with Stacked VLAN

  [<hostname>|<vrname>:]<interface type> <slot>/<port>[.<sub-if>]:
  <svlan id>-<vlan id>

  Examples:

  fastEthernet 1/2.3:4-5
  relayVr:fastEthernet 1/2:4-5
  bostonHost:fastEthernet 1/2.3:4-5

- LAG interface

  [<hostname>|<vrname>:]<interface type> <bundle name>

  Examples:

  lag bundleA
  relayVr:lag bundleA
  bostonHost:lag bundleA

- LAG interface with VLAN

  [<hostname>|<vrname>:]<interface type> <bundle name>[.<sub-if>]:<vlan id>

  Examples:

  lag bundleA.1:2
  relayVr:lag bundleA:2
  bostonHost:lag bundleA.1:2

- LAG interface with Stacked VLAN

  [<hostname>|<vrname>:]<interface type> <bundle name>[.<sub-if>]:
  <svlan id>-<vlan id>

  Examples:

  lag bundleA.1:2-3
  relayVr:lag bundleA:2-3
  bostonHost:lag bundleA.1:2-3

The Agent Remote ID suboption contains a value only when (1) the interface is a dynamic ATM interface and (2) the **subscriber** command is used to configure a username and domain name for the interface. If both conditions are met, the suboption contains a string with the username and domain name in the format: *username@domainname*.

The Vendor-Specific suboption contains a value that includes a JUNOSe data field. You can configure the data field to support one or both of the following values:

- **layer2-circuit-id** (type 1)—The hexadecimal representation of the layer 2 identifier in the Agent Circuit ID (suboption 1) value (for example, the ATM VPI/VCI or Ethernet SVLAN/VLAN ID). You can configure this suboption type without the Agent Circuit ID.

- **user-packet-class** (type 2)—The hexadecimal representation of the user packet class field, whose value is assigned by the layer 2 policy application. The layer 2 policy application can be used to map the DHCP packet or message IEEE 802.1p value to the user packet class field. See the *JUNOSe Policy Management Configuration Guide* for information about layer 2 policies.

Configuration Example—Using DHCP Relay Option 82 to Pass IEEE 802.1p Values to DHCP Servers

Using the DHCP relay agent option 82 feature, you can configure an environment in which a customized DHCP server assigns an IP address that provides the desired service to the DHCP client.

The DHCP server uses information based on the IEEE 802.1p values, which are extracted from the DHCP packets using JUNOSe software layer 2 policies, to determine the appropriate IP address to assign to the client.

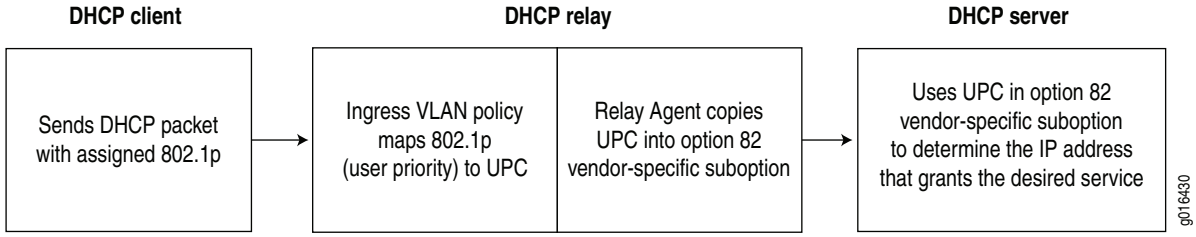
This type of environment, which is illustrated in Figure 13, includes the following components:

- Layer 2 policy on the ingress interface (that is, the interface that receives the client's DHCP packet) that maps the 802.1p value from the packet to a user packet class (UPC.)

NOTE: To ensure optimal performance when mapping 802.1p values to UPCs, order the classifier groups in the VLAN policy list with the most often used UPC values listed first.

- DHCP relay agent option 82 configuration that enables Vendor-Specific suboption type 2 (User Packet Class) support and maps the Layer 2 policy user packet class to the option 82 user packet class suboption.
- Customized DHCP server configuration that assigns IP addresses based on the option 82 user packet class suboption. The IP address is associated with the appropriate quality, type, or class of service for the user packet class specified in the option 82 suboption.

Figure 13: Passing 802.1p Values to the DHCP Server



The following example describes a sample procedure that creates an environment that passes 802.1p values to the DHCP server, which then assigns an IP address that enables the desired service to the DHCP client.

1. Configure a layer 2 policy that maps 802.1p values to user packet class values for a VLAN interface.

```
host1(config)# vlan classifier-list dot1p0 user-priority 0
host1(config)# vlan classifier-list dot1p1 user-priority 1
host1(config)# vlan classifier-list dot1p2 user-priority 2
host1(config)# vlan classifier-list dot1p3 user-priority 3
host1(config)# vlan classifier-list dot1p4 user-priority 4
host1(config)# vlan classifier-list dot1p5 user-priority 5
host1(config)# vlan classifier-list dot1p6 user-priority 6
host1(config)# vlan classifier-list dot1p7 user-priority 7
host1(config)# vlan policy-list dot1pToUpc
host1(config-policy-list)# classifier-group dot1p0
host1(config-policy-list-classifier-group)# user-packet-class 0
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p1
host1(config-policy-list-classifier-group)# user-packet-class 1
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p2
host1(config-policy-list-classifier-group)# user-packet-class 2
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p3
host1(config-policy-list-classifier-group)# user-packet-class 3
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p4
host1(config-policy-list-classifier-group)# user-packet-class 4
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p5
host1(config-policy-list-classifier-group)# user-packet-class 5
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p6
host1(config-policy-list-classifier-group)# user-packet-class 6
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)# classifier-group dot1p7
```

```
host1(config-policy-list-classifier-group)# user-packet-class 7
host1(config-policy-list-classifier-group)#exit
host1(config-policy-list)#exit
host1(config)# profile atm1483BaseProfile
host1(config-profile)# vlan policy input dot1pToUpc statistics enabled
host1(config-profile)#exit
host1(config)#
```

2. (Optional) Verify the policy list configuration.

```
host1(config)# run show policy-list dot1pToUpc

                                Policy Table
                                ------ -----
VLAN Policy dot1pToUpc
   Administrative state: enable
   Reference count:      1
   Classifier control list: dot1p0, precedence 100
      user-packet-class 0
   Classifier control list: dot1p1, precedence 100
      user-packet-class 1
   Classifier control list: dot1p2, precedence 100
      user-packet-class 2
   Classifier control list: dot1p3, precedence 100
      user-packet-class 3
   Classifier control list: dot1p4, precedence 100
      user-packet-class 4
   Classifier control list: dot1p5, precedence 100
      user-packet-class 5
   Classifier control list: dot1p6, precedence 100
      user-packet-class 6
   Classifier control list: dot1p7, precedence 100
      user-packet-class 7

   Referenced by interface(s):
      None

   Referenced by profile(s):
      atm1483BaseProfile  input policy, statistics enabled

   Referenced by merged policies:
      None
```

3. Configure the DHCP relay to use the option 82 suboptions. This configuration includes the command that specifies the mapping of the user packet class values from the layer 2 policy to the user-packet-class type in the option 82 Vendor-Specific suboption.

```
host1(config)# set dhcp relay 192.168.32.1 proxy
host1(config)# set dhcp relay 192.168.32.2
host1(config)# set dhcp relay agent sub-option circuit-id
host1(config)# set dhcp relay agent sub-option remote-id
host1(config)# set dhcp relay agent sub-option vendor-specific
user-packet-class
host1(config)# set dhcp relay agent sub-option vendor-specific
layer2-circuit-id
host1(config)# set dhcp relay options hostname
host1(config)# set dhcp relay options exclude-subinterface-id
host1(config)# set dhcp relay inhibit-access-route-creation
host1(config)# set dhcp relay trust-all
host1(config)# set dhcp relay override agent-option
```

4. (Optional) Verify the DHCP Relay configuration.

```
host1(config)# run show dhcp relay

DHCP Relay Configuration
------------------------
Mode: Proxy
  Restore Client Timeout: 72
Inhibit Access Route Creation: off
Assign Giaddr to Source IP: off
Layer 2 Unicast Replies: off
Giaddr Selects Interface: off
Relay Agent Information Option (82):
  Override Giaddr: off
  Override Option: on
  Trust All Clients: on
  Preserve Option From Trusted Clients: off
  Circuit-ID Sub-option (1): on
    select - hostname
    select - exclude-subinterface-id
  Remote-ID Sub-option (2): on
  Vendor-Specific Sub-option (9): on
    select - layer2-circuit-id
    select - user-packet-class

DHCP Server Addresses
---------------------
192.168.32.1
192.168.32.2
```

Using the set dhcp relay agent Command to Enable Option 82 Suboption Support

NOTE: The **set dhcp relay agent** command, when used to configure option 82 suboptions is a legacy command, which JUNOSe software continues to support to provide backward-compatibility for existing scripts. We recommend that you use the **dhcp relay agent sub-option** command for new option 82 suboption configurations.

You can use the **set dhcp relay agent** command to enable support for DHCP relay agent option, which includes the option 82 suboptions—Agent Circuit ID (suboption 1) and Agent Remote ID (suboption 2). This command does not support the Vendor-Specific option (suboption 9).

The suboptions include information from the DHCP relay agent that the DHCP server can use to implement parameter assignment policies. The DHCP server echoes the suboptions when it replies to the client—the DHCP relay agent can optionally strip the option 82 information before relaying the packets to the client. (Use the CLI command **set dhcp relay preserve-trusted-client-option** to configure this behavior for trusted clients.)

When you issue the **set dhcp relay agent** command, the router adds the configured DHCP relay agent information suboptions to every packet it relays from a DHCP client to a DHCP server.

The **circuit-id-only** keyword specifies the Agent Circuit ID suboption, which contains the following information, based on interface type. This keyword disables support for the Agent Remote ID suboption.

- ATM interface

  [<hostname>|<vrname>:]<interface type> <slot>/<port>[.<sub-if>]:<vpi>.<vci>

  Examples:

  atm 4/1.2:0.101
  relayVr:atm 4/1:0.101
  bostonHost:atm 4/1.2:0.101

- Ethernet interface

  [<hostname>|<vrname>:]<interface type> <slot>/<port>

  Examples:

  fastEthernet 1/2
  relayVr:fastEthernet 1/2
  bostonHost:fastEthernet 1/2

- Ethernet interface with VLAN

  [<hostname>|<vrname>:]<interface type> <slot>/<port>[.<sub-if>]:<vlan id>

  Examples:

  fastEthernet 1/2.3:4
  relayVr:fastEthernet 1/2:4
  bostonHost:fastEthernet 1/2.3:4

- Ethernet interface with Stacked VLAN

  [<hostname>|<vrname>:]<interface type> <slot>/<port>[.<sub-if>]:
  <svlan id>-<vlan id>

  Examples:

  fastEthernet 1/2.3:4-5
  relayVr:fastEthernet 1/2:4-5
  bostonHost:fastEthernet 1/2.3:4-5

- LAG interface

  [<hostname>|<vrname>:]<interface type> <bundle name>

  Examples:

  lag bundleA
  relayVr:lag bundleA
  bostonHost:lag bundleA

- LAG interface with VLAN

  [<hostname>|<vrname>:]<interface type> <bundle name>[.<sub-if>]:<vlan id>

  Examples:

  lag bundleA.1:2
  relayVr:lag bundleA:2
  bostonHost:lag bundleA.1:2

- LAG interface with Stacked VLAN

  [<hostname>|<vrname>:]<interface type> <bundle name>[.<sub-if>]:
  <svlan id>-<vlan id>

  Examples:

  lag bundleA.1:2-3
  relayVr:lag bundleA:2-3
  bostonHost:lag bundleA.1:2-3

The **remote-id-only** keyword specifies the Agent Remote ID suboption, which contains a value only when (1) the interface is a dynamic ATM interface and (2) the **subscriber** command is used to configure a username and domain name for the interface. If both conditions are met, the suboption contains a string with the username and domain name in the format: *username@domainname*. The **remote-id-onl**y keyword disables support for the Agent Circuit ID suboption.

If you do not explicitly specify the **circuit-id-only** or **remote-id-only** keyword, both suboptions are used.

Related Topics

- **radius remote-circuit-id-format** command
- **set dhcp relay** command
- **set dhcp relay agent** command
- **set dhcp relay agent sub-option** command
- **set dhcp relay assign-giaddr-source-ip** command
- **set dhcp relay broadcast-flag-replies** command
- **set dhcp relay giaddr-selects-interface** command
- **set dhcp relay layer2-unicast-replies** command
- **set dhcp relay options** command

- **set dhcp relay override** command
- **set dhcp relay preserve-trusted-client-option** command
- **set dhcp relay trust-all** command
- **set dhcp vendor-option** command

Configuring DHCP Relay Proxy

The DHCP relay proxy is an enhancement to the E-series router's DHCP relay component. The DHCP relay proxy manages host routes for DHCP clients, and determines which offer to use when there are multiple DHCP servers configured.

NOTE: The E-series router configured as a DHCP relay proxy must be the first hop from the DHCP client. If it is not the first hop, the router defaults to the DHCP relay configuration.

Enabling DHCP Relay Proxy

Enable DHCP relay proxy and specify an IP address for the DHCP server. After you are in DHCP relay proxy mode, all **set dhcp relay** commands are supported.

```
host1(config)#set dhcp relay 192.168.29.10 proxy
```

When you issue this command, the router adds the IP address to the list of DHCP servers (up to five) and forwards all request packets to all configured servers.

After you are in DHCP relay proxy mode, all **set dhcp relay** commands are supported.

Use the First Offer from a DHCP Server

You can configure the DHCP relay proxy to use the first offer it receives from any configured DHCP server and send that offer to the DHCP client. By default, DHCP relay proxy sends the most appropriate offer it receives from the configured DHCP servers to the DHCP client.

```
host1(config)#set dhcp relay proxy send-first-offer
```

Set a Timeout for DHCP Client Renewal Messages

You can set the amount of time, in the range 1–168 hours, that the DHCP relay proxy waits for a renewal message from DHCP clients after a router reboot or switchover occurs. A renewal message is required from DHCP clients when a router reboot or switchover occurs. If no renewal message is received before the timeout expires, the relay proxy declares the client no longer active and removes the client's host route By default, DHCP relay proxy uses timeout of 72 hours.

```
host1(config)#set dhcp relay proxy timeout 8
```

NOTE: DHCP relay proxy does not remove a DHCP client's host route when the lease for the client's IP address expires. DHCP relay proxy will instead remove the host route when the relay proxy timeout expires. To prevent a host route from remaining long after lease expiration, modify the relay proxy timeout from its default setting of 72 hours to a setting close to, but not less than the lease time.

Managing Host Routes

The DHCP relay proxy feature enables the E-series router to efficiently manage host routes for DHCP clients, including:

- Installing routes when DHCP clients are configured
- Removing routes when DHCP clients release their DHCP-assigned addresses or when the addresses expire

When a DHCP client sends a request to an external DHCP server, the relay proxy receives the request and forwards it to the external DHCP server. The relay proxy then sends the DHCP server's response back to the client. This process is similar to that used by the DHCP relay component. The DHCP client views the relay proxy as a DHCP server, and the DHCP server sees the relay proxy as a DHCP relay agent.

To DHCP clients, there is no difference when they use a DHCP relay or a DHCP relay proxy. However, the DHCP relay proxy differs from the DHCP relay in how client address renewals and releases are handled:

- With the DHCP relay proxy, DHCP clients communicate with the relay proxy to renew and release addresses.
- With the DHCP relay, DHCP clients communicate directly with the DHCP server to renew and release addresses.

A major benefit of the relay proxy configuration is that the E-series router is kept informed of the status of a DHCP client's address. When addresses are released by clients, the router removes the installed host route for that client. In the DHCP relay configuration, the router does not know when addresses have been renewed or released; the host routes that are no longer needed are still unavailable.

For additional information on managing client bindings, see *Viewing and Deleting DHCP Client Bindings*, in *Chapter 17, DHCP Overview*.

Selecting the DHCP Server Response

Similar to the DHCP relay, the DHCP relay proxy enables you to specify up to five DHCP servers to provide address and configuration information for a DHCP client. As an added benefit over the relay, when using multiple DHCP external servers, you can configure how the DHCP relay proxy determines which offer to send to the DHCP client. You can configure the DHCP relay proxy to use either the single best offer or the first offer it receives from the DHCP servers.

If there are multiple offers, the DHCP relay proxy selects the final offer based on the following priorities:

1. The offer that contains the IP address requested by the DHCP client.
2. The offer that contains an IP address on the same subnetwork as the requested IP address.
3. The offer that has the longest lease time.

If you have enabled the optional select-first-offer feature, the DHCP relay proxy immediately uses the first offer that it receives from any DHCP server.

Behavior for Bound Clients and Address Renewals

When a DHCP client is already bound to an IP address or is renewing the lease on its IP address, DHCP relay proxy unicasts DHCP ACK and DHCP NAK replies to the client regardless of the current configuration of the **set dhcp relay layer2-unicast-replies** command or the **set dhcp relay broadcast-flag-replies** command. These commands control the transmission method used for DHCP reply packets.

This behavior applies only to DHCP relay proxy; it does not apply to DHCP relay because DHCP relay does not maintain a list of active clients or receive address renewal requests from clients.

For information about using the **set dhcp relay layer2-unicast-replies** command, see *Configuring Layer 2 Unicast Transmission Method for Reply Packets to DHCP Clients* on page 428. For information about using the **set dhcp relay broadcast-flag-replies** command, see *Configuring Layer 2 Unicast Transmission Method for Reply Packets to DHCP Clients* on page 428.

Related Topics

- Managing Host Routes on page 446
- **set dhcp relay proxy** command
- **set dhcp relay proxy send-first-offer** command
- **set dhcp relay proxy timeout** command

Chapter 21

Configuring the DHCP External Server Application

This chapter provides information for The following sections describe how to configure the DHCP external server application on the E-series router:

DHCP External Server Overview

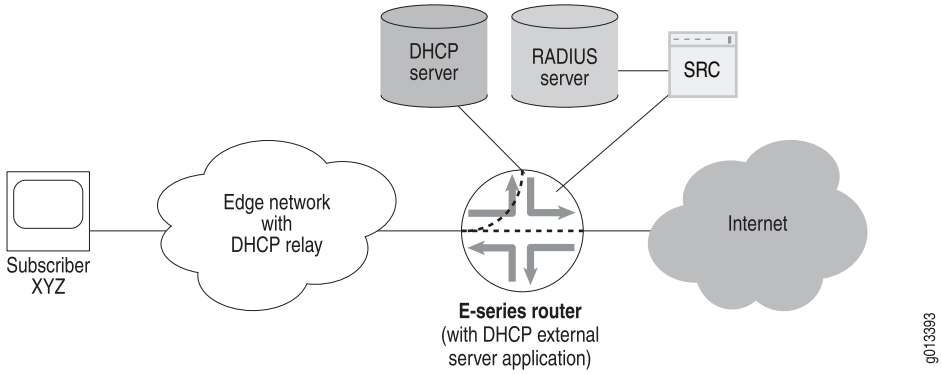
You can configure the E-series router to provide support for an external DHCP server. This enables the router, which is not running DHCP relay or DHCP proxy server, to monitor DHCP packets and to keep information for subscribers based on their IP address and MAC address. When the E-series router's DHCP external server application is used, all DHCP traffic to and from the DHCP server is monitored by the router.

The services provided by integrating the E-series router's DHCP external server application with SRC software are similar to those provided when the DHCP local server is integrated with SRC software. The router's DHCP external application is used together with other features of the router to provide subscriber management. For additional information, see *Chapter 23, Configuring Subscriber Management*.

NOTE: To ensure that DHCP external server with DHCP relay proxy processes unicast reply packets (such as renewal ACK and NAK packets), you must configure DHCP external server with the IP address of the DHCP relay proxy's giaddr. This configuration ensures that DHCP external server processes renewal ACK packets, which in turn enables the updating of client leases.

Figure 14 shows a network that includes an external DHCP server and the E-series router.

Figure 14: DHCP External Server



In Figure 14, the subscriber requests an address from the DHCP server through the E-series router. All communication between the subscriber and the DHCP server is monitored by the E-series router. After the subscriber receives an IP address, the subscriber is able to access the Internet and use the value-added services provided by the E-series router and by the SAE software. For this to occur, the edge network must be using a DHCP relay function.

When the subscriber requests an IP address from the DHCP server, the E-series router performs the following actions:

- Identifies the subscriber's IP address, MAC address, giaddr, and client identifier
- Extracts the lease time, creates a shadow lease, and starts its own lease timer that is associated with the subscriber

The E-series router views the subscriber as active once the subscriber sends a packet. The router then performs the following actions:

- Processes the subscriber's IP address by using a route map
- Extracts the dynamic subscriber interface profile (optional)
- Creates the subscriber's dynamic subscriber interface

If the SRC software is configured, the router also performs the following actions:

- Alerts the SRC software that the dynamic subscriber interface exists
- Alerts the SRC software that the subscriber's address exists and provides DHCP options

The SRC software then provides its enhanced services to the subscriber.

The E-series router monitors all traffic between the subscriber and the DHCP server, and resets the shadow lease by monitoring the DHCP server/client lease renewal. When the subscriber disconnects, the shadow lease will eventually expire. The E-series router then performs the following actions:

- Deletes the subscriber's dynamic subscriber interface
- Alerts the SRC software that the dynamic subscriber interface has been deleted
- Alerts the SRC software that the subscriber's address has been deleted

For additional information on managing client bindings, see *Viewing and Deleting DHCP Client Bindings*, in *Chapter 17, DHCP Overview*.

DHCP External Server Configuration Requirements

To configure the E-series router to support an external DHCP server, you enable the DHCP external server application on the router. If you are using DHCP packet detection, you must also specify each external DHCP server that determines which packets are monitored. The E-series router monitors all DHCP traffic between subscriber clients and the specified DHCP servers.

Enabling and Disabling the DHCP External Server Application

Use to enable the DHCP external server application on the E-series router. Use the no version of the command to disable the application.

To enable the DHCP external server application on the router:

- Issue the **service dhcp-externa**l command:

  host1(config)#**service dhcp-external**

To disable the DHCP external server application on the router:

- Issue the **no service dhcp-external** command:

  host1(config)#**no service dhcp-external**

Related Topics

- **service dhcp-external** command

Monitoring DHCP Traffic Between Remote Clients and DHCP Servers

You can configure the router to monitor DHCP packets between remote clients and specified DHCP servers. You can specify up to four DHCP servers.

To monitor DHCP packets between remote clients and a DHCP server:

- Issue the **ip dhcp-external server-address** command and specify the IP address of the DHCP server:

  host1(config)#**ip dhcp-external server-address 10.10.10.1**
  host1(config)#**ip dhcp-external server-address 10.20.10.1**

  You can specify a maximum of four DHCP servers to monitor.

Related Topics

- **ip dhcp-external server-address** command

Synchronizing the DHCP External Application and the Router

In some cases the router and the DHCP external application might not be synchronized. For example, an unsynchronized condition might occur when you first enable the DHCP external server application. You can resynchronize and create subscriber state information that is based on lease renewals.

To synchronize the external DHCP server with the E-series router:

- Issue the **ip dhcp-external server-sync** command from Global Configuration mode:

  host1(config)#**ip dhcp-external server-sync**

Related Topics

- **ip dhcp-external server-sync** command

Configuring Interoperation with Ethernet DSLAMs

The DHCP external server application uses the giaddr it receives in DHCP server-destined packets to determine the next hop for a subscriber's access routes. However, when interoperating with Ethernet digital subscriber line access multiplexers (DSLAMs), using the giaddr sent by the DSLAM can result in traffic being dropped. To ensure that traffic is forwarded properly, you can configure the DHCP external server application to disregard the DSLAM's giaddr and learn the subscriber's correct next-hop address.

The dropped traffic situation can occur because of the way some DSLAMs create the giaddr that is sent to the DHCP external server application. Some Ethernet DSLAMs use a DHCP relay implementation that inserts giaddr values and relay agent options in DHCP packets that are received from end users. The intent is that this information is provided to a DHCP server, which uses the values to determine the configuration parameters for the subscriber.

However, when the DHCP external server application receives the giaddr from an Ethernet DSLAM, the application installs the subscriber access route with the Ethernet DSLAM's IP address as the next hop, This operation results in the subscriber-destined traffic being incorrectly sent to the Ethernet DSLAM, which cannot process the traffic.

To avoid dropping the traffic in this situation, use the **ip set dhcp-external disregard-giaddr-next-hop** command to configure the DHCP external server application to ignore the giaddr when determining the next hop for the subscriber access routes. The E-series router then uses Address Resolution Protocol (ARP) to discover the subscriber's IP address and sends the traffic to the learned IP address.

To configure the DHCP external server application to ignore the giaddr when determining the next hop for the subscriber access routes:

- Issue the **ip dhcp-external disregard-giaddr-next-hop** command from Global Configuration mode:

  host1(config)#**ip dhcp-external disregard-giaddr-next-hop**

Related Topics

- **ip dhcp-external disregard-giaddr-next-hop** command

Configuring the DHCP External Server to Support the Creation of Dynamic Subscriber Interfaces

You can configure the DHCP external server to support the creation of dynamic subscriber interfaces. This configuration requires that the user's DHCP control traffic and data traffic traverse the same client-facing ingress port on the E-series router.

You must use the **ip dhcp-external auto-configure** command within a specific virtual router context.

To configure the DHCP external server to support the creation of dynamic subscriber interfaces:

- Issue the **ip dhcp-external auto-configure** command from Global Configuration mode:

  host1(config)#**ip dhcp-external auto-configure**

To configure the DHCP external server to support the creation of dynamic subscriber interfaces built over dynamic VLANs that are based on the agent-circuit-id option (suboption 1) of the option 82 field in DHCP messages, include the **agent-circuit-identifier** keyword.

- Issue the **ip dhcp-external auto-configure** command with the **agent-circuit-identifier** keyword from Global Configuration mode:

  host1(config)#**ip dhcp-external auto-configure agent-circuit-identifier**

The use of the option 82 field enables you to stack an IP interface that is associated with a particular subscriber over a dynamically created VLAN; the VLAN is dynamically created based on the agent-circuit-id option (suboption 1) that is contained in the DHCP option 82 field.

For information about configuring agent-circuit-id–based dynamic VLAN subinterfaces, see *JUNOSe Link Layer Configuration Guide, Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

Related Topics

- **ip dhcp-external auto-configure** command

Deleting Clients from a Virtual Router's DHCP Binding Table

You can delete clients from a virtual router's DHCP binding table. You can delete all clients or a specific client.

NOTE: This command is deprecated and might be removed completely in a future release. The function provided by this command has been replaced by the **dhcp delete-binding** command.

To delete clients from a virtual router's DHCP binding table, issue the **dhcp-external delete-binding** command in Privileged Exec configuration mode:

- To delete all clients:

  host1#**dhcp-external delete-binding all**

- To delete a specific client:

  host1#**dhcp-external delete-binding binding-id 3972819365**

Related Topics

- **dhcp delete-binding** command
- **dhcp-external delete-binding** command

Chapter 22

Monitoring and Troubleshooting DHCP

This chapter describes the commands you can use to monitor and troubleshoot DHCP support on E-series routers.

Setting Baselines for DHCP Statistics

You can use the **baseline dhcp** commands to set statistics baselines for DHCP operations. The router implements the baseline by reading and storing the statistics at the time the baseline is set and then subtracting this baseline when you retrieve baseline-relative statistics.

Use the **delta** keyword with the **show dhcp** commands to display baselined statistics.

Tasks to set a baseline for DHCP statistics are:

Setting a Baseline for DHCP Relay and Relay Proxy

To set a statistics baseline for DHCP relay and DHCP relay proxy: :

- Issue the **baseline dhcp relay** command:

```
host1#baseline dhcp relay
```

There is no **no** version.

Setting a Baseline for DHCP Proxy Server Statistics

To set a baseline for DHCP proxy server statistics.

- Issue the **baseline dhcp server** command:

```
host1#baseline dhcp server
```

There is no **no** version.

Setting a Baseline for DHCP External Server Statistics

To set a baseline for DHCP external server statistics.

- Issue the **baseline ip dhcp-external** command:

  host1#**baseline ip dhcp-external**

There is no **no** version.

Setting a Baseline for DHCP Local Server Statistics

To set a baseline for DHCP local server statistics:

- Issue the **baseline ip dhcp-local** command:

  host1#**baseline ip dhcp-local**

There is no **no** version.

To set a baseline for DHCP local server statistics for a specific ATM, Fast Ethernet, or Gigabit Ethernet interface:

- Issue the **baseline ip dhcp-local** command with the optional **interface** keyword to specify the type of interface and interface specifier:

  host1#**baseline ip dhcp-local interface atm 3/1**

To set a baseline for DHCPv6 local server statistics:

- Issue the **baseline ipv6 dhcpv6-local** command:

  host1#**baseline ipv6 dhcpv6-local**

Related Topics

- **baseline dhcp** command
- **baseline ip dhcp-external** command
- **baseline ip dhcp-local** command
- **baseline ipv6 dhcpv6-local** command

Monitoring Addresses Excluded from DHCP Local Server Use

Purpose Display addresses that have been excluded by the **ip dhcp-local excluded-address** command. The DHCP local server does not allocate excluded addresses, because they are already used by devices on the subnetwork.

Action To display excluded IP addresses:

```
host1(config)#show ip dhcp-local excluded
     Dhcp Excluded Addresses
     -----------------------
               Low          High
  Pool       Address      Address
--------   ---------   ----------
default    10.10.1.1
default    10.10.1.5   10.10.1.30
cable2     10.10.2.1
home.com   10.10.3.1
cable4     10.10.4.1
cable5     10.10.5.1
```

Meaning Table 98 lists the **show ip dhcp-local excluded** command output fields.

Table 98: show ip dhcp-local excluded Output Fields

Field Name	Field Description
Pool	Name of the pool that contains the excluded address
Low Address	Excluded address or first address in a range of addresses
High Address	Last address in a range of addresses

Related Topics

- **show ip dhcp-local excluded** command

Monitoring DHCP Bindings

To monitor DHCP bindings, see:

- Monitoring DHCP Binding Information on page 459
- Monitoring DHCP Bindings (Displaying IP Address-to-MAC Address Bindings) on page 461
- Monitoring DHCP Bindings (Displaying DHCP Bindings Based on Binding ID) on page 461
- Monitoring DHCP Bindings (Local Server Binding Information) on page 462

Monitoring DHCP Binding Information

Purpose Display DHCP client binding information.

Use the following keywords to qualify the binding information you want to display. All bindings are displayed if you do not specify an optional keyword.

- **external**—Displays DHCP external server bindings
- **local**—Displays DHCP local server bindings
- **relay-proxy**—Displays DHCP relay proxy bindings
- **detail**—Shows detailed information for the specified DHCP bindings
- **binding-id**—Displays information for the specified DHCP binding

NOTE: This command replaces the **show ip dhcp-external binding**, **show ip dhcp-external binding-id**, and **show ip dhcp-local binding** commands, which are deprecated and might be removed completely in a future release.

Action To display information about all DHCP bindings:

```
host1#show dhcp binding
BindingId      HwAddress      IpSubnet   IpAddress         Type     State
----------   --------------   --------   -------------   --------   -----
3053453401   7000.0002.9365   0.0.0.0    192.168.0.90    external   bound
3053453402   7000.0003.9365   0.0.0.0    192.168.0.91    external   bound
3053453403   7000.0004.9365   0.0.0.0    192.168.0.92    external   bound
3053453404   7000.0005.9365   0.0.0.0    192.168.0.93    external   bound
3053453405   7000.0006.9365   0.0.0.0    192.168.0.94    external   bound
3053453406   7000.0007.9365   0.0.0.0    192.168.0.95    external   bound
3053453407   7000.0008.9365   0.0.0.0    192.168.0.96    external   bound
3053453408   7000.0009.9365   0.0.0.0    192.168.0.97    external   bound
3053453409   7000.000a.9365   0.0.0.0    192.168.0.98    external   bound
3053453410   7000.000b.9365   0.0.0.0    192.168.0.99    external   bound
3053453411   7000.000c.9365   0.0.0.0    192.168.0.100   external   bound
3053453412   7000.000d.9365   0.0.0.0    192.168.0.101   external   bound
3070230529   7000.0001.9365   0.0.0.0    192.168.0.2     relay-p    bound
3070230530   7000.0002.9365   0.0.0.0    192.168.0.90    relay-p    bound
3070230531   7000.0003.9365   0.0.0.0    192.168.0.91    relay-p    bound
3070230532   7000.0004.9365   0.0.0.0    192.168.0.92    relay-p    bound
3070230533   7000.0005.9365   0.0.0.0    192.168.0.93    relay-p    bound
3070230534   7000.0006.9365   0.0.0.0    192.168.0.94    relay-p    bound
```

To display information about a specific DHCP binding ID:

```
host1#show dhcp binding 3070230530
BindingId:   3070230530
HwAddress:   7000.0002.9365
IpSubnet:    0.0.0.0
IpAddress:   192.168.0.90
State:       bound
Type:        relay-p
Server:      192.168.15.1
Giaddr:      192.168.0.1
Lease:       3600
Remaining:   2079
```

```
IpInterface: GigabitEthernet1/0/1.101
ClientId:    45-41-48-00-01-70-00-00-02-93-65
Interface:
Relay Agent:

Agent Circuit Id: test circuit id
Agent Remote Id:  test remote id
Vendor Specific:  01-02-03-04-05-06-07-08-09-0a-0b-0c-0d-0e-0f-10
Unrecognized:     11-12-13-14-15-16-17-18-19-1a-1b-1c-1d-1e-1f-20
```

Meaning Table 99 lists the **show dhcp binding** command output fields.

Table 99: show dhcp binding Output Fields

Field Name	Field Description
BindingId	Client binding ID
HwAddress	MAC address of client
IpSubnet	For DHCP local server bindings, the subnet of the IP address assigned to the client; 0.0.0.0 for DHCP external server and DHCP relay proxy bindings
IpAddress	IP address assigned to client
State	State of the DHCP client binding
Type	Binding type; external (DHCP external server), local (DHCP local server), or relay-p (DHCP relay proxy)
Server	IP address of the DHCP server that allocated the client IP address
Giaddr	For DHCP relay proxy the IP address of the DHCP relay proxy; for DHCP local server bindings, the IP address of the DHCP relay that sent the packet or 0.0.0.0 if the packet comes from the client; for DHCP external server bindings, the giaddr from the DHCP packet
Lease	Total time for which the IP address is available, in seconds
Remaining	Time remaining on the current lease, in seconds
IpInterface	IP interface that is associated with the client
ClientId	DHCP Option 61 received from the client
Interface	Subinterface for DHCP local server bindings; does not apply to DHCP external server and DHCP relay proxy
Relay Agent	Indicates Relay Agent Information option (option 82)
Agent Circuit Id	Suboption 1 of the DHCP Relay Agent information option
Agent Remote Id	Suboption 2 of the DHCP relay agent information option
Vendor Specific	Suboption 9 of the DHCP relay agent information option

Related Topics

- **show dhcp binding** command

Monitoring DHCP Bindings (Displaying IP Address-to-MAC Address Bindings)

NOTE: This command is deprecated and might be removed completely in a future release. The function provided by this command has been replaced by the **show dhcp binding** command.

Purpose Display the mapping between the assigned IP address and the MAC address of the subscriber's computer.

Action To display the DHCP IP address to MAC address bindings:

```
host1#show ip dhcp-external binding

                        Dhcp External Binding
                        ---------------------
   Hardware      IpAddress    Server    Lease   Expire    Interface
--------------   ---------   --------   -----   ------   -----------
3000.0001.9365   10.1.1.2    10.9.3.3   3600    3540     ip201.1.1.2
```

Meaning Table 100 lists the **show ip dhcp-external binding** command output fields

Table 100: show ip dhcp-external binding Output Fields

Field Name	Field Description
Hardware	MAC address of subscriber's computer
IpAddress	Subscriber client's IP address
Server	DHCP server's address
Lease	Time for which the IP address is available, in seconds
Expire	Time remaining on the current lease, in seconds
Interface	Interface that is associated with the subscriber's computer

Related Topics

- **show ip dhcp-external binding** command

Monitoring DHCP Bindings (Displaying DHCP Bindings Based on Binding ID)

NOTE: This command is deprecated and might be removed completely in a future release. The function provided by this command has been replaced by the **show dhcp binding** command.

Purpose Display binding information for all DHCP clients.

Action To display DHCP binding information:

```
host1(config)#show ip dhcp-external binding-id

      Dhcp External Binding Ids
      -------------------------
  Binding
    Id          Hardware      IpAddress
----------   --------------   ---------
3193657721   3000.0001.9365   10.1.1.2
```

Meaning Table 101 lists the **show ip dhcp-external binding-id** command output fie

Table 101: show ip dhcp-external binding-id

Field Name	Field Description
Binding Id	DHCP client binding ID option value associated with the user
Hardware	MAC address of the subscriber's computer
IpAddress	IP address assigned to the client

Related Topics

- **show ip dhcp-external binding-id** command

Monitoring DHCP Bindings (Local Server Binding Information)

NOTE: This command is deprecated and might be removed completely in a future release. The function provided by this command has been replaced by the **show dhcp binding** command.

Purpose Display DHCP local server binding information for DHCP local server clients. Optionally, specify an IP address or an interface to display binding information for a particular address or interface.

Action To display DHCP local server binding information for a specific IP address:

```
host1#show ip dhcp-local binding 192.168.1.3

                    Dhcp Local Bindings
                    -------------------
  Address         Hardware        Lease      Interface         State
-----------   -----------------   -----   ----------------   -------
192.168.1.3   11-11-22-22-33-33   (600)   fastEthernet 5/0   expired
```

To display DHCP local server binding information for a specific interface:

```
host1#show ip dhcp-local binding interface fastethernet 5/0.2

                    Dhcp Local Bindings
                    -------------------
  Address         Hardware        Lease      Interface           State
-----------   -----------------   -----   ------------------   -------
192.168.0.6   40-00-00-0b-00-01   240     fastEthernet 5/0.2   bound
192.168.0.7   40-00-00-0c-00-01   240     fastEthernet 5/0.2   bound
192.168.1.3   11-11-22-22-33-33   (600)   fastEthernet 5/0.2   expired
```

Meaning Table 102 lists the **show ip dhcp-local binding** command output fields.

Table 102: show ip dhcp-local binding Output Fields

Field Name	Field Description
Address	IP address
Hardware	MAC address of subscriber's computer
Lease	Infinite, or the number of seconds in which the IP address is available; grace period is shown in parentheses for clients in a grace period

Table 102: show ip dhcp-local binding Output Fields (continued)

Field Name	Field Description
Interface	Interface whose statistics are reported
State	Binding state; expired or released state for clients currently in the grace period

Related Topics

- **show ip dhcp-local binding** command

Monitoring DHCP External Server Configuration Information

Purpose Display information about the router's DHCP external server application.

Action To display DHCP external server information:

```
host1(config)#show ip dhcp-external configuration
 Dhcp External : Enabled
 Auto-Configure : Enabled
 Server-Sync : Enabled
 Disregard-Giaddr-Next-Hop : Enabled

 Servers:
 -----------
 10.1.1.1
 10.2.1.1
 10.3.1.1
```

Meaning Table 103 lists the **show ip dhcp-external configuration** command output fields.

Table 103: show ip dhcp-external configuration Output Fields

Field Name	Field Description
Dhcp External	Enabled or disabled
Auto-Configure	Enabled or disabled
Server-Sync	Enabled or disabled
Disregard-Giaddr-Next-hop	Enabled or disabled
Servers	DHCP servers whose traffic is monitored by the E-series router

Related Topics

- **show ip dhcp-external configuration** command

Monitoring DHCP External Server Statistics

Purpose Display statistics for all external DHCP servers, or for a specific server.

Action To display statistics for a DHCP external server:

```
host1(config)#show ip dhcp-external statistics server-address 100.20.32.1
DHCP External Statistics
Server Address 10.10.32.1
-------------------------
      Item          Count
-----------------   -----
memUsage              136
bindings                1
request                69
ack (request)        1120
renew               38611
ack (renew)         38611
nak                    42
release                68
lease expirations       0
```

Meaning Table 104 lists the **show ip dhcp-external statistics** command output fields.

Table 104: show ip dhcp-external statistics Output Fields

Field Name	Field Description
memUsage	Memory in bytes used by DHCP server
bindings	Number of IP addresses currently assigned
request	Number of DHCP request packets
ack (request)	Number of DHCP acknowledgment packets in response to DHCP requests
renew	Number of DHCP renew packets
ack (renew)	Number of DHCP acknowledgment packets in response to DHCP renewals
nak	Number of DHCP negative acknowledgment packets
release	Number of DHCP release packets
lease expirations	Number of lease expirations

Related Topics

- **show ip dhcp-external statistics** command

Monitoring DHCP Local Address Pools

Purpose Display the DHCP local pool configurations.

Action To display information about the local address pool:

```
host1#show ip dhcp-local pool

****************************************
Pool Name - ispBoston
Pool Id - 6
Domain Name - ispBoston
Network - 10.10.0.0
Mask - 255.255.255.0
NETBIOS Node Type - 1
Lease - Days:0 Hours:0 Minutes:24 Seconds:0
Grace Period - Days:0 Hours:0 Minutes:10 Seconds:0
Grace period for released leases enabled
DNS Servers
   10.10.1.1
NETBIOS Name Servers
   10.10.1.1
   10.10.1.2
Default Routers
   10.10.1.3
Server Address - 10.10.20.8
Linked Pool - cable5
High utilization threshold - 85%
Abated utilization threshold - 75%
Current utilization - 0%
Utilization trap disabled.
Shared pool allocations - 25
```

To display information about local address pool groups:

```
host1#show ip dhcp-local pool groups

  DHCP Local Server Pool Groups
There is 1 group configured

****************************************
Group Name: pool8_7-1-Group
    Total Addresses Available: 145
    Total Addresses In Use:    0
    High Utilization Thresh:   85%
    Abated Utilization Thresh: 75%
    Current Utilization:       0%
    Trap Enabled:              no
    ====== Pools ======
        pool8_7-1
        pool8_7-2
        pool8_7-3
        pool8_7-4
        pool8_7-5
```

Meaning Table 105 lists the **show ip dhcp-local pool** command output fields.

Table 105: show ip dhcp-local pool Output Fields

Field Name	Field Description
Pool Name	Name of the DHCP local pool
Pool Id	ID of the pool
Domain Name	Domain name assigned to the pool
Network	Addresses that the DHCP local server can provide from the pool
Mask	Subnet mask that goes with the network address
NETBIOS Node Type	Type of NetBIOS server: 1 = Broadcast 2 = Peer-to-peer 4 = Mixed 8 = Hybrid
Lease	Time for which the supplied IP address is valid
Grace Period	Length of grace period
Grace period for released leases	Status of the grace period for released leases; enabled or disabled
DNS Servers	Address of each DNS server assigned to the pool
NETBIOS Name Servers	NetBIOS server assigned to subscribers
Default Routers	Address of default router used for subscribers
Server Address	DHCP server address that is sent to subscribers
Linked Pool	Names of any pools that are linked to this pool
High utilization threshold	Threshold at which the utilization trap is triggered, if the trap is enabled
Abated utilization threshold	Threshold at which the utilization trap is reenabled after the trap has been triggered
Current utilization	Percentage of local address pool currently used
Utilization trap	Status of the utilization trap, which is generated when the high utilization threshold is reached; enabled or disabled
Shared pool allocations	Number of addresses allocated to shared pools
Group Name	Group name; based on the name of the original pool
Total Addresses Available	Number of addresses in the group
Total Addresses In Use	Number of addresses currently being used
Trap Enabled	Status of utilization trap, yes or no
Pools	Names of pools in the group

Related Topics

- **show ip dhcp-local pool** command

Monitoring DHCP Local Server Authentication Information

Purpose Display the DHCP local server's AAA authentication configuration information and statistics.

Action To display DHCP local server AAA authentication configuration:

```
host1#show ip dhcp-local auth config

DHCP Local Server Authentication Configuration

User-Prefix          : ERX4-Boston
Domain               : ISP1.com
Password             : to4TooL8
Virtual Router       : included
Circuit Type         : included
Circuit ID           : included
MAC Address          : excluded
Option 82            : excluded
```

To display DHCP local server AAA authentication statistics:

```
host1#show ip dhcp-local auth statistics

DHCP Local Server Authentication Statistics

----------------------------------------
       Item                    Count
-----------------------       ----------
auth requests                 10
auth request failures         0
auth grants                   9
auth denies                   1
```

Meaning Table 106 lists the **show ip dhcp-local auth** command output fields.

Table 106: show ip dhcp-local auth Output Fields

Field Name	Field Description
User-Prefix	Client's user prefix
Domain	Client's domain
Password	Password used to authenticate client
Virtual Router	Client's virtual router; excluded or included
Circuit Type	Client's circuit type; excluded or included
Circuit ID	Client's circuit ID; excluded or included
MAC Address	Client's MAC address; excluded or included
Option 82	Status of client's option 82 field; excluded or included
auth requests	Number of authorization requests received by this DHCP local server
auth request failures	Number of authorization requests that have failed
auth grants	Number of authorization requests that have been granted
auth denies	Number of authorization requests that have been denied

Related Topics

- **show ip dhcp-local auth** command

Monitoring DHCP Local Server Configuration

Purpose Display the DHCP local server's configuration information.

Action To display configuration settings for DHCP local server:

```
host1#show ip dhcp-local

****************************************
     DHCP Local Server Configuration
Mode: Standalone
SNMP Traps Enabled - no
Unique Client IDs  - enabled
```

Meaning Table 107 lists the **show ip dhcp-local** command output fields.

Table 107: show ip dhcp-local Output Fields

Field Name	Field Description
Mode	DHCP local server mode, equal-access or standalone
SNMP Traps Enabled	Status of DHCP local traps support, yes or no
Unique Client IDs	Status of duplicate client ID and duplicate hardware address detection, enabled or disabled

Related Topics

- **show ip dhcp-local** command

Monitoring DHCP Local Server Leases

Purpose Display lease information for a specific IP address or for all DHCP local server leases.

Action To display information about a specific DHCP local server lease:

```
host1#show ip dhcp-local leases 192.168.0.3

                          Dhcp Local Leases
                          -----------------
Address            Hardware         Lease         Initiated/Renewed
------------   -----------------   --------   ----------------------------
192.168.0.3    10-06-10-00-10-33   120        THU SEP 08 2005 08:02:11 UTC

Address                 Expiration             Remaining
------------   ----------------------------   ---------
192.168.0.3    THU SEP 08 2005 08:04:11 UTC   79

Address            Initial Lease Start
------------   ----------------------------
192.168.0.3    THU SEP 08 2005 08:01:12 UTC
```

To display information about all DHCP local server leases:

```
host1#show ip dhcp-local leases

                        Dhcp Local Leases
                        -----------------
Address           Hardware         Lease         Initiated/Renewed
-----------   -----------------   --------   ----------------------------
192.168.0.2    10-06-10-00-10-32   120        THU JUL 06 2006 08:02:11 UTC
192.168.0.3    10-06-10-00-10-33   120        THU JUL 06 2006 08:02:11 UTC
192.168.55.4   10-06-10-00-10-34   (600)      THU JUL 06 2006 09:57:22 UTC
192.168.55.5   10-06-10-00-10-35   infinite   THU JUL 06 2006 08:03:10 UTC
Address               Expiration              Remaining
-----------   --------------------------   ---------
192.168.0.2    THU JUL 06 2006 08:04:11 UTC   80
192.168.0.3    THU JUL 06 2006 08:04:11 UTC   80
192.168.55.4   THU JUL 06 2006 10:07:22 UTC   575
192.168.55.5   THU JUL 06 2006 08:04:11 UTC   infinite
Address           Initial Lease Start
-----------   --------------------------
10.1.0.2       THU JUL 06 2006 08:01:12 UTC
10.1.0.3       THU JUL 06 2006 08:01:12 UTC
192.168.55.4   THU JUL 06 2006 09:54:19 UTC
192.168.55.5   THU JUL 06 2006 08:03:10 UTC
```

Meaning Table 108 lists the **show ip dhcp-local leases** command output fields.

Table 108: show ip dhcp-local leases Output Fields

Field Name	Field Description
Address	IP address
Hardware	MAC address of the subscriber's computer
Lease	Infinite, or the number of seconds in which the IP address is available; grace period in parentheses for clients in the grace period
Initiated/Renewed	Day, date, and time the lease was most recently initiated or renewed; start time of grace period for clients in the grace period
Expiration	Day, date, and time the lease expires; expiration time of grace period for clients in the grace period
Remaining	Infinite, or the number of seconds remaining in the lease, if any; remaining time of grace period for clients in the grace period
Initial Lease Start	Day, date, and time the lease was initiated

Related Topics

- **show ip dhcp-local leases** command

Monitoring DHCP Local Server Statistics

Purpose Display statistics for the DHCP local server.

Action To display all DHCP local server statistics:

```
host1#show ip dhcp-local statistics

DHCP Local Server Statistics
 ---------------------------
         Item             Count
----------------------   -----
memUsage                   184
bindings                     2
--Receive Statistics--
  discover                   8
  request(accept)           10
  request(renew)             6
  request(rebind)            2
  request(other)             6
  decline                    0
  release                    6
  inform                     0
  total in packet           38
  in error                   0
  in discard                 0
  unknown client packet      6
--Transmit Statistics--
  offer                      8
  ack(accept)               10
  ack(renew)                 6
  ack(rebind)                2
  nak                        6
  nak(renew)                 0
  nak(rebind)                0
  total out packet          32
  out error                  0
  out discard                0
```

To display DHCP local server statistics for a specific interface:

```
host1#show ip dhcp-local statistics interface atm 4/0.32

    DHCP Local Server SubInterface Statistics
      Interface          Item                Count
------------------  --------------       -------------
ATM4/0.32
Receive Statistics
                    discover               4
                    request(accept)        5
                    request(renew)         1
                    request(rebind)        1
                    request(other)         3
                    decline                0
                    release                3
                    inform                 0
                    total in packet        17
                    in error               0
                    in discard             0
                    unknown client packet  3
```

```
Transmit Statistics
                        offer                   4
                        ack(accept)             5
                        ack(renew)              1
                        ack(rebind)             1
                        nak                     3
                        nak(renew)              0
                        nak(rebind)             0
                        total out packet        14
                        out error               0
                        out discard             0
```

Meaning Table 109 lists the **show ip dhcp-local statistics** command output fields.

Table 109: show ip dhcp-local statistics

Field Name	Field Description
memUsage	Number of bytes of memory used by the DHCP local server
bindings	Number of leased IP addresses currently assigned
Receive Statistics	Statistics for packets that have been received
discover	Number of DHCP discover messages received
request(accept)	Number of DHCP requests accepted
request(renew)	Number of DHCP requests for renewal received
request(rebind)	Number of DHCP requests for rebinding received
request(other)	Number of DHCP unknown requests received
decline	Number of DHCP decline messages received
release	Number of DHCP release messages received
inform	Number of DHCP inform messages received
total in packet	Number of packets received
in error	Number of packets received with errors that prevent further processing; count is independent of the message-type counters
in discard	Number of packets received that are discarded due to system resource issues; count is independent of the message-type counters
unknown client packet	Number of nonrequest packets that have no entry in the local server database received
Transmit Statistics	Statistics for packets that have been transmitted
offer	Number of DHCP offer messages sent
ack(accept)	Number of DHCP acknowledgments sent in response to accepted requests
ack(renew)	Number of DHCP acknowledgments sent in response to renewal requests
ack(rebind)	Number of DHCP acknowledgments sent in response to rebinding requests
nak	Number of DHCP NAK messages sent in response to requests that cannot be bound or that are unknown to this local server
nak(renew)	Number of DHCP NAK messages sent in response renewal requests
nak(rebind)	Number of DHCP NAK messages sent in response to rebinding requests
total out packet	Number of packets sent by the DHCP local server

Table 109: show ip dhcp-local statistics (continued)

Field Name	Field Description
out error	Number of packets that cannot be transmitted due to protocol errors or configuration errors; count is independent of the message-type counters
out discard	Number of packets that cannot be transmitted due to system resource issues; count is independent of the message-type counters

Related Topics

- **show ip dhcp-local statistics** command

Monitoring DHCP Option 60 Information

Purpose Display configuration and action information for the DHCP vendor-option (option 60) feature.

- Use the command without additional keywords to display information for all vendor option configurations.
- Use the **vendor-option-relay-server** keyword and server address to display information for option 60 strings that match a configured string that results in the packets being sent to the specified vendor-option server.
- Use the **default** keyword to display information for option 60 strings that do not match a configured vendor-option string.

Action To display information for all vendor option configurations:

```
host1#show dhcp vendor-option
Codes:
 *       - the configured vendor-string is an exact-match
 default - all DHCP client packets not matching a configured vendor-string
 implied - the DHCP application is configured but has not been enabled
           with the vendor-option command
 drop    - the DHCP application responsible for the action has not been
           configured yet therefore all packets for this application
           will be dropped
 Total 4 entries.
         Vendor-option                          Action
------------------------------ ----------------------------------------
Juniper                        relay to 10.10.1.1 (rx: 0)
default(*)                     relay to 192.168.5.5 (rx: 0, no-match: 0)
someString(*)                  relay to 192.168.7.7 (rx: 0)
someString2(*)                 local-server (rx: 0)
```

To display information for option 60 strings that match a configured string:

```
host1#show dhcp vendor-option vendor-option-relay-server 10.10.1.1
Codes:
 *       - the configured vendor-string is an exact-match
 default - all DHCP client packets not matching a configured vendor-string
 implied - the DHCP application is configured but has not been enabled
           with the vendor-option command
 drop    - the DHCP application responsible for the action has not been
           configured yet therefore all packets for this application
           will be dropped
 Total 4 entries.
         Vendor-option                          Action
------------------------------- ----------------------------------------
Juniper                         relay to 10.10.1.1 (rx: 0)
```

Meaning Table 110 lists the **show dhcp vendor-option** command output fields.

Table 110: show dhcp vendor-option Output Fields

Field Name	Field Description
Vendor-option	Option 60 string; an asterisk (*) indicates that the string exactly matches a configured option 60 string, default indicates the action to take when the string does not match a configured option 60 string
Action	Action to take for the indicated string match; drop, forward to local-server, proxy client server, or all configured DHCP vendor option servers; or relay to the specified DHCP server
rx	Received packets that match a vendor-option string
no-match	Received packets that do not match a vendor-option string; no-match statistics appear only for default entries

Related Topics

- **show dhcp vendor-option** command

Monitoring DHCP Packet Capture Settings

Purpose Display the configuration for per-interface DHCP packet logging.

Action To display configuration information about the DHCP packet capture feature:

```
host1#show ip dhcp-capture

      Dhcp Capture Configuration
      --------------------------
Router    Interface   Type    Priority
-------   ---------   -----   --------
default   ip3/1       Rx/Tx   low/low
default   ip5/1       Rx      high
```

Meaning Table 111 lists the **show ip dhcp-capture** command output fields.

Table 111: show ip dhcp-capture Output Fields

Field Name	Field Description
Router	Router name
Interface	Interface whose DHCP packets are logged
Type	Packet type to be logged, Rx (received), Tx (transmitted), or Rx/Tx (all)
Priority	Priority assigned to logged packets, low or high

Related Topics

- **show ip dhcp-capture** command

Monitoring DHCP Relay Configuration Information

Purpose Display DHCP relay configuration information and the IP addresses of the configured DHCP servers.

Action To display information about the DHCP relay configuration and the IP address of the DHCP servers.

```
host1#show dhcp relay

DHCP Relay Configuration
------------------------
Mode: Proxy
  Restore Client Timeout: 72
  Send First Offer: off
Inhibit Access Route Creation: off
Assign Giaddr to Source IP: off
Layer 2 Unicast Replies: off
Giaddr Selects Interface: off
Broadcast Flag Replies: on
Relay Agent Information Option (82):
  Override Giaddr: off
  Override Option: off
  Trust All Clients: off
  Preserve Option From Trusted Clients: off
Circuit-ID Sub-option (1): on
    select - hostname
    select - exclude-subinterface-id
  Remote-ID Sub-option (2): on
  Vendor-Specific Sub-option (9): on
    select - layer2-circuit-id
    select - user-packet-class

DHCP Server Addresses
---------------------
30.3.7.1
```

Meaning Table 112 lists the **show dhcp relay** command output fields.

Table 112: show dhcp relay Output Fields

Field Name	Field Description
Mode	DHCP relay mode; either Standard (DHCP relay mode) or Proxy (DHCP relay proxy mode)
Restore Client Timeout	(DHCP relay proxy mode only) number of hours
Send First Offer	On or off
Inhibit Access Route Creation	On or off
Assign Giaddr to Source IP	On or off
Layer 2 Unicast Replies	On or off
Giaddr Selects Interface	On or off
Broadcast Flag Replies	On or off
Override Giaddr	On or off
Override Option	On or off
Trust All Clients	On or off
Preserve Option From Trusted Clients	On or off
Circuit-ID Sub-option (1)	On or off; when on includes a list of selected suboptions
Remote-ID Sub-option (2)	On or off
Vendor-Specific Sub-option (9)	On or off; when on includes a list of selected suboptions
DHCP Server Addresses	IP addresses of configured DHCP servers

Related Topics

- **show dhcp relay** commands

Monitoring DHCP Relay Proxy Statistics

Purpose Display statistics for the DHCP relay proxy.

NOTE: The **show dhcp relay statistics** command displays additional DHCP statistics that the router reports for both DHCP relay and DHCP relay proxy.

Action To display DHCP relay proxy statistics:

```
host1#show dhcp relay proxy statistics

                        DHCP Relay/Proxy Statistics
                        ---------------------------
    Address     Disc.  Offer    Req.     Ack     Nak   Decline Release Inform
--------------- ------ ------ -------- -------- ------ ------- ------- ------
    192.168.1.1      9      0        0        0      0       0       0      0
    192.168.1.2      9      0        0        0      0       0       0      0
   192.168.32.1      9      5        5        5      0       0       0      0
```

```
Active Clients: 5
Clients to Restore: 0
Client Packets: 14
Server Packets: 10
Timed Out: 0
No Offers: 4
Modify Fail: 0
```

Meaning Table 113 lists the **show dhcp relay proxy statistics** command output fields.

Table 113: show dhcp relay proxy statistics Output Fields

Field Name	Field Description
Address	IP address of the DHCP server
Disc.	Number of discover messages sent to server
Offer	Number of offers received from a server
Req.	Number of requests sent to a server
Ack	Number of ACK messages received from a server
Nak	Number of NAK messages received from a server
Decline	Number of decline messages sent to a server
Release	Number of releases sent to a server
Inform	Number of information messages sent to a server
Active Clients	Number of clients being maintained by the relay proxy
Clients to Restore	Number of host routes installed without an active client (waiting for renewal)
Client Packets	Total number of packets received from clients
Server Packets	Total number of packets received from servers
Timed Out	Number of clients removed because of lease expiration
No Offers	Number of clients removed because no server sent an offer
Modify Fail	Number of clients deleted because the relay proxy failed to modify the DHCP packet

Related Topics

- **show dhcp relay proxy statistics** command

Monitoring DHCP Relay Statistics

Purpose Display DHCP packet error and relay agent option statistics that are reported for both DHCP relay and DHCP relay proxy, and also to display DHCP server statistics related only to DHCP relay.

NOTE: The **show dhcp relay proxy statistics** command displays additional DHCP statistics that the router reports only for DHCP relay proxy.

Action To display DHCP relay statistics:

```
host1#show dhcp relay statistics

                      DHCP Relay Statistics
                      ---------------------
                        Statistic                                Values
-------------------------------------------------------------   ------
Packet error statistics (standard & proxy modes):
  dropped discover packets, no resources                        0
  dropped dhcp packets, no resources                            0
  dropped bad message operation packets                         0
  dropped unknown message type request packets                  0
  dropped unknown message type reply packets                    0
Relay Agent Option statistics (standard & proxy modes):
  add Relay Agent Option circuit ID suboption                   On
  add Relay Agent Option remote ID suboption                    On
  packets with giaddr override                                  0
  packets with Relay Agent Option override                      2
  packets forwarded with Relay Agent Option already present     4
  dropped packets with Relay Agent Option already present       3
  dropped giaddr spoof packets                                  0
DHCP server statistics (standard mode only):
  dropped duplicate request packets                             12
  packets transmitted to servers                                38
  packets received from servers                                 26
  dropped unknown xid reply packets                             0
  dropped stale request packets                                 12
```

To display detailed statistics for DHCP relay only, use the optional **detail** keyword—this command displays DHCP server statistics and dropped unknown message type reply packets statistics:

```
host1#show dhcp relay statistics detail

                    DHCP Relay Detail Statistics
                    ----------------------------
            Statistics                 10.10.1.1  192.168.32.12   192.168.32.1
-----------------------------------   ---------  -------------   ------------
Dropped unknown message type replies   0          0               0
Dropped duplicate requests             6          6               0
Packets transmitted to server          6          6               26
Packets received from server           0          0               26
Dropped unknown xids replies           0          0               0
Dropped stale requests                 6          6               0
```

Meaning Table 114 on page 477 lists the **show dhcp relay statistics** command output fields.

Table 114: show dhcp relay statistics Output Fields

Field Name	Field Description
Packet error statistics (standard & proxy modes)	
dropped discover packets, no resources	Number of received DHCP relay discover messages that were discarded because of lack of resources
dropped dhcp packets, no resources	Number of received DHCP relay messages, other then discover messages, that were discarded because of lack of resources

Table 114: show dhcp relay statistics Output Fields (continued)

Field Name	Field Description
dropped bad message operation packets	Number of received DHCP relay messages that were discarded because their message operation (for example, bootrequest, bootreply) was unknown, possibly due to corruption
dropped unknown message type request packets	Number of received DHCP relay request messages that were discarded because their message type (for example, discover, offer-request) was unknown, possibly due to corruption
dropped unknown message type reply packets	Number of received DHCP relay reply messages that were discarded because their message type (for example, offer, ack) was unknown, possibly due to corruption
Relay Agent Option statistics (standard & proxy modes)	
add Relay Agent Option circuit ID suboption	Status of circuit ID suboption, on or off
add Relay Agent Option remote ID suboption	Status of remote ID suboption, on or off
packets with giaddr override	Number of received DHCP relay requests whose giaddr field is overridden with IP address 0.0.0.0
packets with Relay Agent Option override	Number of received DHCP relay requests whose relay agent information option is overridden with an option string created by this relay agent
packets forwarded with Relay Agent Option already present	Number of received DHCP relay requests already containing the relay agent information option that were forwarded to DHCP servers
dropped packets with Relay Agent Option already present	Number of received DHCP relay requests that were discarded because they already contained the relay agent information option when this relay agent was configured to insert the option
dropped giaddr spoof packets	Number of received DHCP relay requests that were discarded because the gateway IP address field already contained this relay agent's IP address
DHCP server statistics (standard mode only)	
dropped duplicate request packets	Number of received DHCP relay requests that were discarded because they have a matching server address and XID of an outstanding DHCP server request
packets transmitted to servers	Number of DHCP relay requests successfully transmitted to DHCP servers
packets received from servers	Number of DHCP relay replies successfully received from DHCP servers
dropped unknown xid reply packets	Number of DHCP relay replies received from DHCP servers that were discarded because their server address and XID do not match an outstanding DHCP server request
dropped stale request packets	Number of DHCP relay requests sent to DHCP servers that were discarded because their replies timed out

Related Topics

- **show dhcp relay statistics** command

Monitoring DHCP Server and DHCP Relay Agent Statistics

Purpose Display DHCP proxy server statistics

Action To display statistics for the DHCP proxy server:

```
host1#show dhcp server statistics
 DHCP Proxy Global Statistics
        Messages from Unknown Servers 0

                    DHCP Proxy Server Statistics
                    ----------------------------
     Statistic          Counts        Counts         Counts
-------------------   -----------   ----------   --------------
DHCP Server Address   10.6.128.10   10.10.0.42   192.168.200.10
Discovers sent        0             0            0
leases granted        0             0            0
Offers received       0             0            0
Requests sent         0             0            0
Acks received         0             0            0
Naks received         0             0            0
addresses declined    0             0            0
addresses released    0             0            0
Informs sent          0             0            0
unknown messages      0             0            0
bad messages          0             0            0
```

Meaning Table 115 lists the **show dhcp server statistics** command output fields

Table 115: show dhcp server statistics Output Fields

Field Name	Field Description
DHCP Server Address	IP address of the server
Discovers sent	Number of discover messages sent by the server
leases granted	Number of leases granted by the server
Offers received	Number of offers sent by the server
Requests sent	Number of requests sent to the server
Acks received	Number of acknowledgments received from the server
Naks received	Number of negative acknowledgments received from the server
addresses declined	Number of IP addresses rejected because they were already in use
addresses released	Number of IP addresses released back to the server
Informs sent	Number of inform messages sent to the server
unknown messages	Number of illegal DHCP messages or messages that cannot be handled by the router
bad messages	Number of messages not recognized as DHCP messages

Related Topics

- **show dhcp server statistics** command

Monitoring DHCP Server and Proxy Client Information

Purpose Display DHCP server and proxy client information.

Action To display information about the DHCP server and proxy clients:

```
host1#show dhcp server
                        DHCP Proxy Client Status:
                        -------------------------
O A Address     Leases Offers Requests Acks Naks Declines Releases
- - ----------- ------ ------ -------- ---- ---- -------- --------
E E 10.6.128.10      0      0        0    0    0        0        0
E E 10.6.128.11      0      0        0    0    0        0        0
```

Meaning Table 116 lists the **show dhcp server** command output fields.

Table 116: show dhcp server Output Fields

Field Name	Field Description
O	Read-only value that displays the operational status of the server
A	Read/write value that displays the administrative status of the server
E	Enabled; indicates that the server is being actively used to supply IP addresses to clients
D	Draining; indicates that the server is not accepting any new requests for addresses, but is maintaining the addresses that it has already assigned
X	Disabled; means that the server is not accepting any new requests for addresses and has no outstanding addresses
Address	IP address of a DHCP server
Leases	Number of IP address leases granted by the server
Offers	Number of offers sent by the server
Requests	Number of requests sent to the server
Acks	Number of acknowledgments received from the server
Naks	Number of negative acknowledgments received from the server
Declines	Number of IP addresses rejected because they were already in use
Releases	Number of IP addresses released back to the server

Related Topics

- **show dhcp server** command

Monitoring DHCPv6 Local Server Binding Information

Purpose Display the mapping between one or more IPv6 addresses and the DHCP unique ID of the subscriber's computer.

Meaning Table 117 lists the **show ipv6 dhcpv6-local statistics** command output fields.

Table 117: show ipv6 dhcpv6-local binding Output Fields

Field Name	Field Description
Prefix	IPv6 address
Client DUID	DHCP unique ID of subscriber's computer
Lease	Time for which the IPv6 address is available in seconds, or infinite
Intf	Router's interface that is associated with the subscriber's computer

Action To display the DHCP binding information for an IPv6 address:

```
host1#show ipv6 dhcpv6-local binding 2001:db8:4::/48

   Prefix           Client DUID        Lease            Intf
-------------   -------------------   --------   ------------------
2001:db8:4::/48 <LL 1/00A0DE113502>   infinite   FastEthernet 3/6.1
```

Related Topics

- **show ipv6 dhcpv6-local binding** command

Monitoring DHCPv6 Local Server DNS Search Lists

Purpose Display the DHCPv6 local servers DNS search list.

Action To display the DNS search list for DHCPv6 local servers:

```
host1#show ipv6 dhcpv6-local dns-domain-searchlist
Domain 1: xyzcorporation.net
Domain 2: xyzcorp.com
Domain 3: financeDomain.com
Domain 4: researchDomain.com
```

Meaning Table 118 lists the **show ipv6 dhcpv6-local dns-domain-searchlist** command output fields.

Table 118: show ipv6 dhcpv6-local dns-domain-searchlist Output Fields

Field Name	Field Description
Domain	Domains in the search list

Related Topics

- **show ipv6 dhcpv6-local dns-domain-searchlist** command

Monitoring DHCPv6 Local Server DNS Servers

Purpose Display a list of DNS servers configured on the DHCPv6 local server.

Action To display the list of DNS servers:

```
host1#show ipv6 dhcpv6-local dns-servers
DNS server 1: 2001:db8:18::
DNS server 2: 2001:db8:19::
DNS server 3: 2001:db8:20::
DNS server 4: 2001:db8:21::
```

Meaning Table 119 lists the **show ipv6 dhcpv6-local dns-servers** command output fields.

Table 119: show ipv6 dhcpv6-local dns-servers Output Fields

Field Name	Field Description
DNS server	IPv6 address of the DNS server

Related Topics

- **show ipv6 dhcpv6-local dns-servers** command

Monitoring DHCPv6 Local Server Prefix Lifetime

Purpose Display the DHCPv6 default prefix lifetime.

Action To display the DHCPv6 default prefix lifetime:

```
host1#show ipv6 dhcpv6-local prefix-lifetime
default prefix lifetime is 1 day, 12 hours, 30 minutes
```

Meaning Table 120 lists the **show ipv6 dhcpv6-local prefix-lifetime** command output fields.

Table 120: show ipv6 dhcpv6-local prefix-lifetime Output Fields

Field Name	Field Description
default prefix lifetime	Number of days, hours, and minutes

Related Topics

- **show ipv6 dhcpv6-local prefix-lifetime** command

Monitoring DHCPv6 Local Server Statistics

Purpose Display statistics for the DHCPv6 local server.

Action To display DHCPv6 local server statistics:

```
host1#show ipv6 dhcpv6-local statistics

DHCPv6 Local Server Statist
---------------------------
       Item           Count
-------------------   -----
memUsage                136
bindings                  1
solicit rx                1
request(accept) rx        1
request(renew) rx         0
decline rx                0
release rx                0
inform rx                 0
confirm rx                0
rebind rx                 0
reconfigure tx            0
advertise tx              1
successful reply tx       1
failed reply tx           0
unknown msgs              0
bad msgs                  0
```

Meaning Table 121 lists the **show ipv6 dhcpv6-local statistics** command output fields.

Table 121: show ipv6 dhcpv6-local statistics Output Fields

Field Name	Field Description
memUsage	Number of bytes of memory used by DHCPv6 local server
bindings	Number of leased IPv6 prefixes currently assigned
solicit rx	Number of DHCPv6 solicit messages received
request(accept) rx	Number of DHCPv6 request messages received
request(renew) rx	Number of DHCPv6 requests for renewal received
decline rx	Number of DHCPv6 decline messages received
release rx	Number of DHCPv6 release messages received
inform rx	Number of DHCPv6 information-request messages received
confirm rx	Number of DHCPv6 confirm messages received
rebind rx	Number of DHCPv6 rebind messages received
reconfigure tx	Number of DHCPv6 reconfigure messages transmitted
advertise tx	Number of DHCPv6 advertise messages transmitted
successful reply tx	Number of reply messages transmitted with success reply code
failed reply tx	Number of reply messages transmitted with reply codes other than success
unknown msgs	Unused field; always 0
bad msgs	Number of messages with errors received by the DHCPv6 local server

Related Topics

- **show ipv6 dhcpv6-local statistics** command

Monitoring Duplicate MAC Addresses Use By DHCP Local Server Clients

Purpose Display duplicate MAC addresses that are being used by DHCP local server clients.Optionally, display information for a specific duplicate MAC address.

Action To display information about a specific MAC address being used by multiple clients:

```
host1#show ip dhcp-local duplicate-clients 00-0D-61-7F-67-70
MAC   00-0D-61-7F-67-70
        Interface             Count           Time
        ATM 3/0.1             100             Sat Sept 17, 2005 06:00:51 UTC
        ATM 3/0.2             90              Sun Sept 18, 2005 09:00:00 UTC
```

Meaning Table 122 lists the **show ip dhcp-local duplicate-clients** command output fields.

Table 122: show ip dhcp-local duplicate-clients Output Fields

Field Name	Field Description
MAC	Duplicate MAC address
Interface	Interfaces used by the duplicate MAC address
Count	Number of times the duplicate MAC address has been detected
Time	Date and time the first duplication was detected

Related Topics

- **show ip dhcp-local duplicate-clients** command

Monitoring the Maximum Number of Available Leases

Purpose Display the maximum number of leases available for each VPI/VCI, VLAN, Ethernet subnetwork, or for a specific interface or subinterface.

Action To display the maximum number of leases available for each interface type:

```
host1(config)#show ip dhcp-local limits

****************************************
     DHCP Local Server Address Limits
ATM Limit      - 5000
VLAN Limit     - 2000
Ethernet Limit - 1000
```

To display information about the maximum number of leases for a specific interface:

```
host1(config)#show ip dhcp-local limits interface atm 3/1

        Dhcp Local Interface Limits
        ---------------------------
                                        Total
Interface   Limit   Count   Denied   Denied
---------   -----   -----   ------   ------
atm 3/1     300     127     5        29
```

To display information about the maximum number of leases on all interfaces:

```
host1(config)#show ip dhcp-local limits interface

          Dhcp Local Interface Limits
          ---------------------------
                                              Total
Interface         Limit   Count   Denied   Denied
---------         -----   -----   ------   ------
fastEthernet0/0   200     0       0        0
atm 3/1           300     127     5        29
atm 4/2           5000    0       0        0
atm 5/1           5000    15      2        5
```

Meaning Table 123 lists the **show ip dhcp-local limits** command output fields.

Table 123: show ip dhcp0local limits Output Fields

Field Name	Field Description
ATM Limit	Number of leases available for each VPI/VCI
VLAN Limit	Number of leases available for each VLAN
Ethernet Limit	Number of leases available for each Ethernet subnet
Limit	Number of leases available to the specified interface or subinterface; indicates the configured value for the interface type unless a specific lease value is configured for the particular interface
Count	Number of active leases on the interface
Denied	Number of lease requests denied during the current denial period; this number is reset to zero (and the denial period restarted) when the number of active leases no longer exceeds the configured limit
Total Denied	Total number of lease requests denied on the interface since the interface became active

Related Topics

- **show ip dhcp-local limits** command

Monitoring Static IP Address and MAC Address Pairs Supplied by DHCP Local Server

Purpose Display the static IP address/MAC address pairs that the DHCP local server supplies in standalone mode.

Action To display information about static IP address/MAC address pairs:

```
host1#show ip dhcp-local reserved
                          Dhcp Reserved Addresses
                          -----------------------
   Pool         Address                          Hardware
----------   ------------   ------------------------------------------------
cablemodem   10.44.44.100   12-34-12-34-12-34-00-00-00-00-00-00-00-00-00-00
cablemodem   10.44.44.101   22-33-22-33-22-33-00-00-00-00-00-00-00-00-00-00
```

Meaning Table 124 lists the **show ip dhcp-local reserved** command output fields.

Table 124: show ip dhcp-local reserved Output Fields

Field Name	Field Description
Pool	Name of pool in which the address is reserved
Address	IP address that is reserved
Hardware	Address for which the IP address is reserved

Related Topics

- **show ip dhcp-local reserved** command

Monitoring Status of DHCP Applications

Purpose Display which DHCP applications are configured whether they are active or inactive—displays the status of DHCP relay, DHCP relay proxy, DHCP local server, and DHCP external server.

Action To display the status of the configured DHCP applications:

```
host1#show dhcp summary
DHCP local-server configured and inactive
DHCP relay configured and active
```

Meaning Table 125 lists the **show dhcp summary** command output fields.

Table 125: show dhcp summary Output Fields

Field Name	Field Description
configured	Applications that are currently configured
active or inactive	Current status of the application

Related Topics

- **show dhcp summary** command

Part 5

Managing the Subscriber Environment

Chapter 23

Configuring Subscriber Management

This chapter describes how to set up subscriber management on the E-series router. Subscriber management integrates a variety of router features and enables you to manage your constantly changing subscriber environment without affecting the performance you provide to your customers.

The following sections discuss subscriber management:

Overview

The E-series router enables customers to create a unified subscriber management, provisioning, and service delivery environment. The flexibility of the router provides a variety of methods and configurations that enable customers to dynamically provision new subscribers and quickly create new value-added services.

Two major aspects of subscriber management are subscriber provisioning and differentiated service delivery. The E-series router enables you to use both static and dynamic methods to add and delete subscribers. Important subscriber management concepts provided by JUNOSe subscriber management include:

- Subscriber use of a shared medium
- Multiple subscribers using the same primary interface
- User authentication and accounting
- Differentiated services for individual subscribers

A subscriber management environment can include the following components:

- Local Dynamic Host Configuration Protocol (DHCP) server
- External DHCP server
- RADIUS server
- Session and Resource Control (SRC) software

You employ the components you need in a variety of configurations, depending on your specific requirements.

Platform Considerations

Subscriber management is supported on all E-series routers.

For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

Subscriber Management Attributes

E-series routers take advantage of many of the JUNOSe features to enable you to create the subscriber management environment that best meets your requirements. These features include:

- Authentication—Uses RADIUS to determine whether a user can access a specific service or resource.
- Accounting—Uses RADIUS and policy management to track service usage that can be used for volume-based billing.
- Dynamic address assignment—Uses RADIUS, DHCP, and profiles to dynamically allocate IP addresses to subscribers.
- Dynamic policy management—Uses policy and quality of service (QoS) management to assign and monitor subscriber bandwidth restrictions.
- Security—Uses policy management, source address validation, and media access control (MAC) address validation to grant subscriber access and to enable the use of classification when monitoring subscriber traffic flows.
- Dynamic interfaces—Automatically creates an interface column based on a catalyst packet or event.

- Marking—Uses policy management marking to enable differential treatment of specific packets.
- Policy routing—Uses policy management routing policies to assign subscriber routes that are based on classification.

Dynamic IP Subscriber Interfaces

You can set up your subscriber management environment to create dynamic IP subscriber interfaces in two situations—when a DHCP event occurs or when a packet is detected.

In the first case, the interface is created when an external DHCP server or the DHCP local server responds to a subscriber request. In the second case, the subscriber interface is created when the router receives a packet (the packet detect feature) with a source IP address that is not in the demultiplexer table. In this second case the primary IP interface must be in autoconfiguration mode.

Subscriber management uses the following process when validating the IP source address of the packet:

- If the address is not valid, no subscriber interface is created. A discard entry is added to the demultiplexer table, and an error message is generated.
- If the address is valid with respect to the address ranges configured on the primary IP interface, subscriber management uses packet information to select the appropriate dynamic subscriber interface profile. The commands corresponding to the profile are then used to create the subscriber interface.

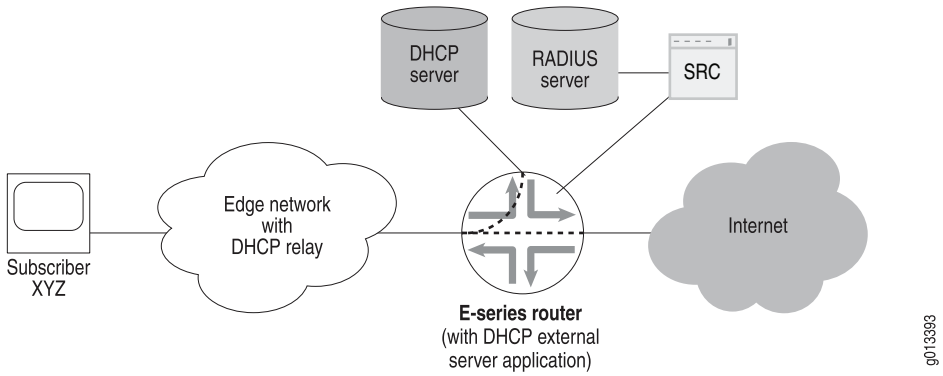
Subscriber Management Procedure

Figure 15 shows a subscriber management environment that includes an external DHCP server, a RADIUS server, the SRC software, and the DHCP external server application running on the E-series router.

The E-series router DHCP external server application is used with other JUNOSe features to provide subscriber management. Using the router's DHCP external server application for subscriber management enables you to take advantage of the following features:

- Profile assignment—A dynamic subscriber interface profile is associated with a specific source address by the router's packet detect feature.
- Dynamic subscriber interface packet detection and inactivity timer—Subscriber interfaces are dynamically created based on packet information that is identified by the packet detection feature. The inactivity timer determines when a dynamic subscriber interface expires and needs to be deleted.
- DHCP external server application—DHCP packets are examined to determine the state of subscribers.

Figure 15: DHCP External Server



In Figure 15, the subscriber requests an address from the DHCP server. The E-series router DHCP external server application monitors all DHCP communications between the subscriber and the DHCP server. After the subscriber receives an IP address, the subscriber can access the Internet and use the value-added services provided by the SRC software. The following list describes the various procedures performed in the subscriber management environment:

- Subscriber PC—Requests an IP address from the DHCP server
- E-series router
  - Monitors DHCP traffic between the subscriber and the DHCP server:
    - Identifies the subscriber's IP address, MAC address, giaddr, and client identifier
    - Extracts the lease time, creates a shadow lease, and starts its own lease timer that is associated with the subscriber
  - Determines the subscriber is active when the subscriber sends a packet after receiving an IP address from DHCP. The router then:
    - Processes the subscriber's IP address by using a route map
    - Extracts the dynamic subscriber interface profile (optional)

      The router uses the profile to provide authentication, authorization, accounting, and address assignment. RADIUS uses the profile to obtain information for the subscriber's IP interface.
    - Creates the subscriber's dynamic subscriber interface (DSI)

- If the SRC software is configured, the router also alerts the SRC software that the subscriber's DSI and address exist.
- The DHCP external server application continues to monitor all traffic between the subscriber and the DHCP server, and periodically resets the shadow lease it originally created when the subscriber first requested an IP address. When the subscriber disconnects, the shadow lease eventually expires, at which time the E-series router performs the following:
  - Deletes the DSI
  - Alerts the SRC software that the DSI has been deleted
  - Alerts the SRC software that the subscriber's address has been deleted

- SRC software—Provides enhanced services to the subscriber.

Configuring Subscriber Management with an External DHCP Server

To configure subscriber management for clients by using an external DHCP server, as in Figure 15, use the following procedure on E-series routers:

1. Enable the DHCP external server application.

   host1(config)#**service dhcp-external**

2. Specify each DHCP server for which to monitor traffic. You can specify a maximum of four DHCP servers.

   host1(config)#**ip dhcp-external server-address 10.10.10.1**

3. Configure a default policy for subscribers, using a previously configured classifier group.

   host1(config)#**ip policy-list filterAll**
   host1(config-policy-list)#**classifier-group filterGroupA**
   host1(config-policy-list-classifier-group)#**filter**
   host1(config-policy-list-classifier-group)#**exit**
   host1(config-policy-list)#**exit**

4. Configure a dynamic subscriber interface policy.

   host1(config)#**profile disableUser**
   host1(config-profile)#**ip policy input filterAll**
   host1(config-profile)#**ip policy output filterAll**
   host1(config-profile)#**exit**

5. Configure a route map.

```
host1(config)#route-map routeMapWest21
host1(config-route-map)#set ip interface-profile disableUser
host1(config-route-map)#exit
```

6. Enable autoconfiguration mode.

```
host1(config)#interface gigabitEthernet 12/0
host1(config-if)#ip address 192.168.1.1 255.255.255.0
host1(config-if)#ip auto-configure ip-subscriber include-primary
host1(config-if)#ip route-map ip-subscriber routeMapWest21
host1(config-if)#ip auto-detect ip-subscriber
host1(config-profile)#exit
```

Subscriber Management Commands

This section describes the commands that you use to configure subscriber management. For commands related to a specific component, see the appropriate documentation.

- DHCP—*Chapter 17, DHCP Overview*
- Policies—*JUNOSe Policy Management Configuration Guide*
- QoS—*JUNOSe Quality of Service Configuration Guide*
- Route maps—*JUNOSe IP Services Configuration Guide, Chapter 1, Configuring Routing Policy*
- SRC software—SRC software documentation set

clear ip demux

- Use to clear all dynamically created demultiplexer table entries associated with the route-map processing of the **set ip source-prefix** command.
  - **deny**—Drop addresses that appear in the source address range
  - **primary**—Associate the source prefix with the primary IP interface
- Example

  ```
  host1(config-if)#clear ip demux
  ```

- There is no **no** version.

domain

- Use to specify a domain for an IP service profile.
- The domain is included in a username that is dynamically created by JUNOSe subscriber management.
- The specify a domain name with up to 32 ASCII characters.
- Example

  host1(config-service-profile)#**domain eastcoast**

- Use the **no** version to remove the domain from the IP service profile.

include circuit-identifier

- Use to include the circuit identifier in the username that is dynamically created by JUNOSe subscriber management.
- Specify one of the following circuit types: atm or vlan.
- Use the optional **prepend-circuit-type** keyword to specify that the circuit type is prepended to the circuit identifier in the username.
- Example

  host1(config-service-profile)#**include circuit-identifier atm prepend-circuit-type**

- Use the **no** version to disable inclusion of the circuit identifier in the username.

include dhcp-option 82

- Use to include a suboption of the DHCP relay agent information option (option 82) in the username that is dynamically created by JUNOSe subscriber management.
- Specify one of the following suboptions: **agent-circuit-id** or **agent-remote-id**.
- Example

  host1(config-service-profile)#**include dhcp-option 82 agent-circuit-id**

- Use the **no** version to disable inclusion of the suboption in the username.

include hostname

- Use to include the router hostname in the username that is dynamically created by JUNOSe subscriber management.
- Example

  host1(config-service-profile)#**include hostname**

- Use the **no** version to disable inclusion of the router hostname in the username.

include ip-address

- Use to include the IP address in the username that is dynamically created by JUNOSe subscriber management.
- Example

  host1(config-service-profile)#**include ip-address**

- Use the **no** version to disable inclusion of the IP address in the username.

include mac-address

- Use to include the MAC address identifier in the username that is dynamically created by JUNOSe subscriber management.
- Example

  host1(config-service-profile)#**include mac-address**

- Use the **no** version to disable inclusion of the MAC address in the username.

include virtual-router-name

- Use to include the virtual router name in the username that is dynamically created by JUNOSe subscriber management.
- Example

  host1(config-service-profile)#**include virtual-router-name**

- Use the **no** version to disable inclusion of the virtual router name in the username.

ip auto-configure ip-subscriber

- Use to configure an IP interface to support creation of dynamic subscriber interfaces. The specified IP interface is considered the primary interface.
- The router creates the required dynamic subscriber interfaces when the IP address is assigned to the associated subscriber. The address might be assigned by an external DHCP server, the DHCP local server, or the packet detect feature.
- Use the **include-primary** keyword to specify that the primary interface can be assigned to a subscriber. Use the **exclude-primary** keyword to specify that the primary interface cannot be used for subscribers. The primary interface is not assigned to a subscriber by default.
- You can issue this command from Interface Configuration mode, Subinterface Configuration mode, or Profile Configuration mode.
- Example

  host1(config-if)#**ip auto-configure ip-subscriber include-primary**

- Use the **no** version to disable creation of dynamic subscriber interfaces associated with this primary IP interface. Use the **no** version with the **include-primary** keyword to specify that the primary interface is not assigned to a subscriber. Use the **no** version with the **exclude-primary** keyword to specify that the primary interface is assigned to a subscriber.

ip auto-detect ip-subscriber

- Use to set the router packet detect feature and specify that IP automatically detect packets that do not match any entries in the demultiplexer table. When an unmatched packet is detected, an event is generated that determines whether to create a dynamic subscriber interface or configure an existing interface.
- You can issue this command from Interface Configuration mode or Profile Configuration mode.
- Example

  host1(config-if)#**ip auto-detect ip-subscriber**

- Use the **no** version to restore the default, in which packet detection is disabled.

ip destination-prefix

- Use to specify a destination address for a subscriber interface or for a primary IP interface.
- Use the **deny** keyword to drop all packets that match the command.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example

  host1(config-if)#**ip destination-prefix 10.0.0.0 255.0.0.0**

- Use the **no** version to remove the association between the interface and the specified IP destination address and mask.

ip inactivity-timer

- Use to configure the inactivity timer value.
- A dynamically created subscriber interface is deleted if it is inactive for a period longer than the inactivity timer value.
- On static interfaces, the subscriber's access route is removed when the inactivity timer is exceeded. When the subscriber logs back in, the timer is restarted.
- The timer value can in the range 1–65335 minutes.
- A timer value of 0 specifies that dynamically created subscriber interfaces are never deleted by the inactivity timer.
- Example

  host1(config-if)#**ip inactivity-timer 100**

- Use the **no** version to restore the default, in which inactivity timer feature is disabled.

ip route-map ip-subscriber

- Use to configure an interface to perform route-map processing, and to specify the route map that is applied to the IP interface subscriber. If no route map is specified, then all packets trigger the creation of a dynamic subscriber interface.
- You can issue this command from Interface Configuration mode or Profile Configuration mode.
- Example

  host1(config-if)#**ip route-map ip-subscriber bostonRouteMap**

- Use the **no** version to delete the route map.

ip service-profile

- Use to specify a service profile name and to enter IP Service Profile Configuration mode. Service profiles contain user and password information, and are used in route maps for subscriber management and to authenticate subscribers with RADIUS.
- You can specify a service profile name with up to 32 ASCII characters.
- To use the subscriber management application to configure IP subscribers on dynamic bridged Ethernet interfaces to support RADIUS authentication, you can create an IP service profile and assign it to a dynamic bridged Ethernet interface profile. If your router is running stateful SRP switchover (high availability), using an IP service profile to configure subscriber authentication is preferable to using either the **subscriber** command or the **atm atm1483 subscriber** command because these commands can suspend stateful SRP switchover on the router or prevent it from becoming active.

  For more information, see *Authenticating Subscribers on Dynamic Bridged Ethernet over Static ATM Interfaces* in *JUNOSe Link Layer Configuration Guide, Chapter 15, Configuring Dynamic Interfaces*, or *Authenticating Subscribers on Dynamic Bridged Ethernet over Dynamic ATM Interfaces* in *JUNOSe Link Layer Configuration Guide, Chapter 16, Configuring Dynamic Interfaces Using Bulk Configuration*.

- Example

  host1(config)#**ip service-profile class1Service**
  host1(config-service-profile)#

- Use the **no** version to delete the service profile.

ip source-prefix

- Use to specify a source address for a subscriber interface.
- Use the **deny** keyword to drop all packets that match the command.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example

  host1(config-if)#**ip source-prefix 10.0.0.0 255.0.0.0**

- Use the **no** version to remove the association between the interface and the specified IP source address and mask.

ip use-framed-routes ip-subscriber

- Use to configure a static primary IP interface to use framed routes as source IP addresses when creating dynamic subscriber interfaces. The router uses the Framed-Route RADIUS attribute [22] sent in Access-Accept messages to apply framed routes to subscriber interfaces associated with the primary interface.
- Example

  host1(config-if)#**ip use-framed-routes ip-subscriber**

- Use the **no** version to disable the use of framed routes when creating dynamic subscriber interfaces associated with this primary IP interface.

password

- Use to specify the password for an IP service profile. The password is used as the dynamically created password by JUNOSe subscriber management.
- You can specify a password with up to 32 ASCII characters.
- Example

  host1(config-service-profile)#**password mypassword**

- Use the **no** version to remove the password from the IP service profile.

set ip interface-profile

- Use to specify a dynamic subscriber interface profile that is used in the route map.
- Example

  host1(config)#**route-map mapForEPort**
  host1(config-route-map)#**set ip interface-profile disableUser**

- Use the **no** version to delete the interface profile from the route map.

set ip service-profile

- Use to specify the name of a subscriber's service profile that is used in the route map.
- You can specify a service profile name with up to 32 ASCII characters.
- Example

  host1(config-route-map)#**set ip service-profile yourServiceProfile**

- Use the **no** version to remove the service profile from the route map.

set ip source-prefix

- Use to specify a source address range to be inserted into a specific interface, and the action to take with the range.
  - **deny**—Drop addresses that appear in the source address range
  - **primary**—Associate the source prefix with the primary IP interface
- Example

  host1(config-route-map)#**set ip source-prefix 10.10.30.0 255.255.255.0 primary**

- Use the **no** version to remove the source address range from the route map.

user-name

- Use to specify the username for an IP service profile. The username is used as the dynamically created username by JUNOSe subscriber management.
- You can specify a username with up to 32 ASCII characters.
- Example

  host1(config-service-profile)#**user-name westford211**

- Use the **no** version to remove the user name from the IP service profile.

user-prefix

- Use to specify a user prefix for an IP service profile.
- This command appends the user prefix to the username that is dynamically created by JUNOSe subscriber management.
- Example

  host1(config-service-profile)#**user-prefix xyz.atl**

- Use the **no** version to remove the user prefix from the IP service profile.

vlan service-profile

- Use to assign an IP service profile to a VLAN subinterface. Service profiles contain user and password information, and are used in route maps for subscriber management and to authenticate subscribers with RADIUS.
- You can specify a service profile name with up to 32 ASCII characters.
- Example

  host1(config-profile)#**vlan service-profile vlanClass1Service**
  host1(config-profile)#

- Use the **no** version to remove the service profile from the VLAN subinterface.

Configuration Examples

This section contains examples of creating dynamic usernames and shows the usernames that are generated. The examples all use the following IP policy, interface profile, and route map:

- An IP policy that restricts access.

  host1(config)#**ip policy-list restrictAccess**
  host1(config-policy-list)#**classifier-group ***
  host1(config-policy-list-classifier-group)#**filter**
  host1(config-policy-list-classifier-group)#**exit**
  host1(config-policy-list)#**exit**
  host1(config)#

- An interface profile that references the restrictAccess policy.

  host1(config)#**profile atlInterfaceProfile**
  host1(config-profile)#**ip policy input restrictAccess**
  host1(config-profile)#**ip policy output restrictAccess**
  host1(config-profile)#**exit**
  host1(config)#

- A route map that references the interface profile and the atlServiceProfile service profile.

  host1(config)#**route-map atlRouteMap**
  host1(config-route-map)#**set interface-profile atlInterfaceProfile**
  host1(config-route-map)#**set ip service-profile atlServiceProfile**
  host1(config-route-map)#**exit**
  host1(config)#

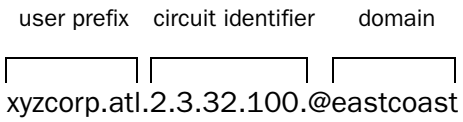
Each example shows the configuration of a service profile that enables RADIUS authentication.

Username with ATM Circuit Identifier and No Circuit Type

This example shows the steps to configure a service profile for a username that includes the ATM circuit identifier, but does not include the circuit type.

```
host1(config)#ip service-profile atlServiceProfile
host1(config-service-profile)#user-prefix xyzcorp.atl
host1(config-service-profile)#domain eastcoast
host1(config-service-profile)#include hostname
host1(config-service-profile)#include circuit-identifier atm
host1(config-service-profile)#exit
host1(config)#
```

The example generates the following username:



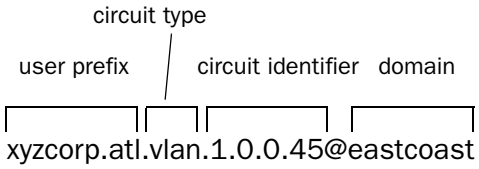
The circuit identifier indicates a user at slot 2, port 3, with a virtual path identifier (VPI) of 32 and a virtual channel identifier (VCP) of 100.

Username with VLAN Circuit Identifier and Circuit Type

This example shows the steps to configure a service profile for a username that includes a VLAN circuit identifier and the circuit type.

```
host1(config)#ip service-profile atlServiceProfile
host1(config-service-profile)#user-prefix xyzcorp.atl
host1(config-service-profile)#domain eastcoast
host1(config-service-profile)#include hostname
host1(config-service-profile)#include circuit-identifier vlan prepend-circuit-type
host1(config-service-profile)#exit
```

The example generates the following username:



The circuit identifier indicates a user on slot 1, port 0, no stacked vlan, and a vlan ID of 45.

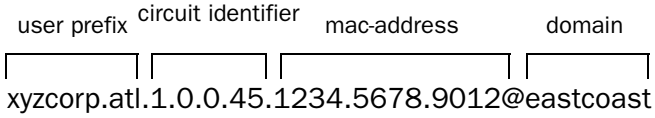
Username with MAC Address

This example shows the steps to configure a service profile that generates a username that includes a MAC address.

NOTE: Including a MAC address in a username works only for DHCP users. It does not work for IP subscribers that have statically configured IP addresses.

```
host1(config)#ip service-profile atlServiceProfile
host1(config-service-profile)#user-prefix xyzcorp.atl
host1(config-service-profile)#domain eastcoast
host1(config-service-profile)#include hostname
host1(config-service-profile)#include circuit-identifier vlan
host1(config-service-profile)#include mac-address
host1(config-service-profile)#include dhcp-option 82 agent-circuit-id
host1(config-service-profile)#exit
host1(config)#
```

The example generates the following username, which includes the MAC address:



Chapter 24

Monitoring Subscriber Management

This chapter describes how to monitor subscriber management on the E-series router.

The following sections describe commands you can use to display status information and statistics for the subscriber management environment:

Monitoring IP Service Profiles

Purpose Display information for all IP service profiles or for a specific profile.

Action To display information about IP service profiles:

```
host1#show ip service-profile
ip service-profile west500
  user-name: finance22
  user-prefix: xyz.bos
  domain: xyzcorp.net
  include virtual-router-name
  include mac-address
  include circuit-identifier atm prepend-circuit-type
  password: 4398aa

ip service-profile atlSerPro9
  user-name: salesCorp
  domain:  xyzcorp.net
  include virtual-router-name
  include circuit-identifier vlan
  password: u473qv
```

Meaning Table 126 lists the **show ip service-profile** command output field.

Table 126: show ip service-profile Output Fields

Field Name	Field Description
ip service-profile	Name of profile
user-name	Username used to retrieve information from RADIUS for subscriber interfaces

Table 126: show ip service-profile Output Fields (continued)

Field Name	Field Description
user-prefix	User prefix used to retrieve information from RADIUS for subscriber interfaces
domain	Domain used to retrieve information from RADIUS for subscriber interfaces
include ip-address	IP address is included in the service profile
include virtual-router-name	Virtual router is included in the service profile
include mac-address	MAC address is included in the service profile
include circuit-identifier	Circuit identifier that is included in the service profile; atm or vlan, and whether the circuit type is prepended
include hostname	Router hostname is included in the service profile
include dhcp-option 82	Suboptions of DHCP option 82 are included in the service profile: agent-circuit-id or agent-remote-id
password	Password used to retrieve information from RADIUS for subscriber interfaces

Related Topics

- **show ip service-profile** command

Monitoring Active IP Subscribers Created by Subscriber Management

Purpose Display information about active IP subscribers that were created by the JUNOSe software's subscriber management feature.

Action To display information about subscribers created by subscriber management:

```
host1#show ip-subscriber 2835349506

                                          Virtual
    Id         User Name      Ip Address    Router      Interface
----------   --------------   -----------   -------   -------------
2835349506   user1@isp1.com   192.168.0.1   default   ip192.168.0.1

    Id         Login time
----------   ------------------------
2835349506   WED AUG 23 20:46:24 2006

host1#show ip-subscriber detail

                           Subscriber List
                           ---------------
                                          Virtual
    Id         User Name      Ip Address    Router      Interface
----------   --------------   -----------   -------   -------------
2835349506   user1@isp1.com   192.168.0.1   default   ip192.168.0.1
```

```
                                                                  Profile
    Id              Login Time             Mac Address            Handle
----------   ------------------------   --------------   --------
2835349506   WED AUG 23 20:46:24 2006   3000.0001.9365   13631489

             Interface   Service
    Id        Profile    Profile        Option 82
----------   ---------   ---------   ----------------
2835349506   myProfile   profile22   FastEthernet 3/1
```

Meaning Table 127 lists the **show ip-subscriber** command output field.

Table 127: show ip-subscriber Output Fields

Field Name	Field Description
Id	ID of the subscriber
User Name	Username used to retrieve information from RADIUS for the subscriber interface
Ip Address	IP address of the subscriber interface
Virtual Router	Name of the virtual router on which the subscriber interface is configured
Interface	Name of subscriber interface; **ip** indicates that subscriber manager created this interface
Login Time	Day, date, and time that the subscriber logged in
Mac Address	MAC address of the subscriber
Profile Handle	AAA profile handle
Interface Profile	Interface profile name used to configure the subscriber interface
Service Profile	IP service profile name used by subscriber management to authorize and configure the subscriber interface with AAA
Option 82	DHCP relay agent information (option 82) circuit identifier that describes the physical interface location associated with the subscriber

Related Topics

- **show ip-subscriber** command

Chapter 25

Configuring Subscriber Interfaces

This chapter describes how to configure static and dynamic subscriber interfaces for remote access to the E-series router. This chapter contains the following sections:

Overview

You can configure E-series routers to create subscriber interfaces statically or dynamically.

The following list shows the underlying (layer 2) interfaces on which you can currently configure each type of subscriber interface.

- Static subscriber interfaces
  - Bridged Ethernet over ATM (with and without VLANs)
  - Fast Ethernet (with and without VLANs)
  - Gigabit Ethernet (with and without VLANs)
  - 10-Gigabit Ethernet (with and without VLANs)
  - IP over ATM
  - POS
  - Generic Routing Encapsulation (GRE) tunnels

- Dynamic subscriber interfaces
  - Bridged Ethernet over ATM (with and without VLANs)
  - Fast Ethernet (with and without VLANs)
  - Gigabit Ethernet (with and without VLANs)
  - 10-Gigabit Ethernet (with and without VLANs)
  - GRE tunnels

For information about platform support for subscriber interfaces, see *Platform Considerations* on page 514.

Relationship to Shared IP Interfaces

A subscriber interface is an extension of a *shared IP interface*. A shared IP interface is one of a group of IP interfaces that use the same layer 2 interface.

Shared IP interfaces are unidirectional—they can transmit but not receive traffic. In contrast, subscriber interfaces are bidirectional—they can both receive and transmit traffic.

For details about shared IP interfaces, see *Shared IP Interfaces* in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

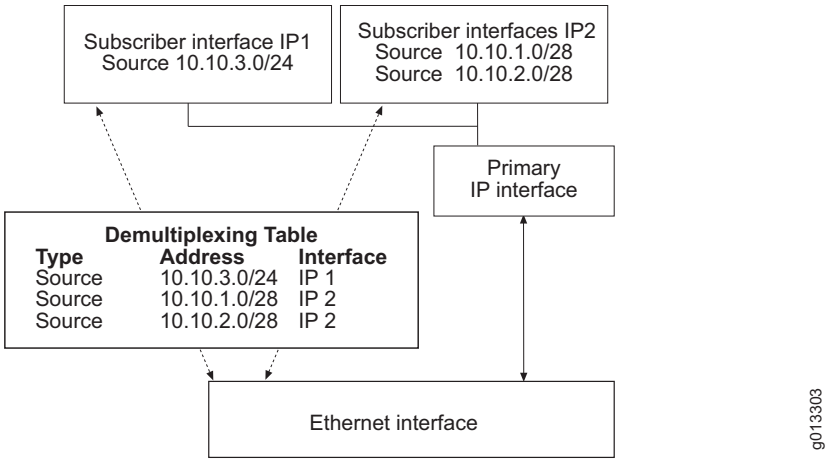
Relationship to Primary IP Interfaces

A subscriber interface operates only with a *primary IP interface*—a normal IP interface on a supported layer 2 interface, such as Ethernet. You create a primary interface by assigning an IP address to the Ethernet interface. Although you can configure a subscriber interface directly on an Ethernet interface, the subscriber interface does not operate until you assign an IP address to the Ethernet interface.

To configure a subscriber interface you must associate either a source address or a destination address with the interface. The router receives packets on a subscriber interface after demultiplexing the packet according to the specified source address or destination address. You can associate multiple source addresses or multiple destination addresses with a subscriber interface. However, a single primary interface and its associated subscriber interfaces can only demultiplex source addresses or destination addresses at any given time.

For example, Figure 16 illustrates the relationship between subscriber interfaces, an associated primary IP interface, and an associated Ethernet interface.

Figure 16: Subscriber Interfaces over Ethernet



When the router receives traffic on a primary interface, the primary interface performs a lookup in its demultiplexing table. If the result of the lookup is a subscriber interface, the traffic is received on the associated subscriber interface.

NOTE: You can use the **set dhcp relay giaddr-selects-interface** command to specify that the primary interface is identified by information in the giaddr field of DHCP ACK messages. By default, the router identifies the primary interface based on the interface used by the DHCP-destined packets. See *Using the Giaddr to Identify the Primary Interface for Dynamic Subscriber Interfaces* in *Chapter 20, Configuring DHCP Relay*.

Ethernet Interfaces and VLANs

In the absence of VLANs, Ethernet does not have a demultiplexing layer. A subscriber interface adds a demultiplexing layer for an Ethernet interface that is configured without VLANs. Using subscriber interfaces, the router can demultiplex or separate the traffic associated with different subscribers.

You can configure subscriber interfaces with VLANs. If you do so, the E-series router demultiplexes packets by using first the VLAN and then the subscriber interface.

Moving Interfaces

A shared IP interface that has associated subscriber demultiplexing attributes retains these attributes when it moves.

For details about moving shared IP interfaces, see *Moving IP Interfaces* in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

Preventing IP Spoofing

You can prevent IP spoofing on subscriber interfaces by using media access control (MAC) address validation.

For information about configuring MAC address validation, see *MAC Address Validation* in *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

For information about the relationship between the MAC address validation state and dynamically created subscriber interfaces, see *Inheritance of MAC Address Validation State for Dynamic Subscriber Interfaces* on page 519.

Routing Protocols

You configure unicast routing protocols on subscriber interfaces in the same way that you configure routing protocols on primary IP interfaces, provided that you configure them to use unicast addressing when communicating with a peer. You can also enable multicast routing protocols such as IGMP on subscriber interfaces; however, we do not recommend this type of configuration.

Policies and QoS

You can configure policies, such as rate limiting and filtering, and quality of service (QoS) for subscriber interfaces in the same way that you do for primary IP interfaces. For more information, see the *JUNOSe Policy Management Configuration Guide* and the *JUNOSe Quality of Service Configuration Guide*.

Applications

In a cable modem network, service providers can use subscriber interfaces to:

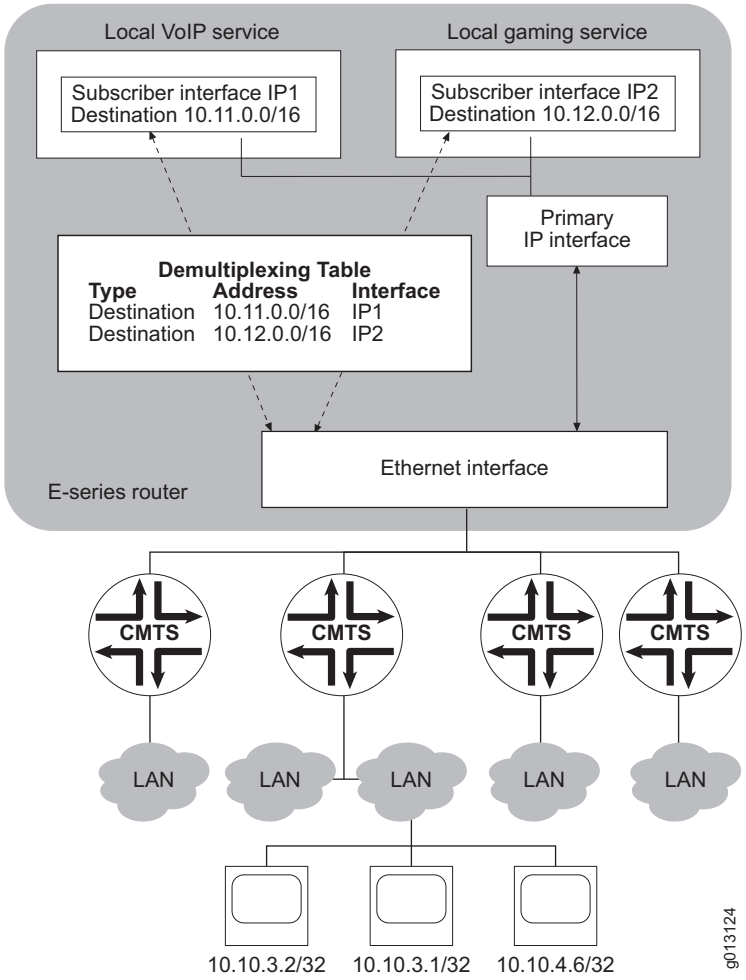
- Direct traffic toward special local content in the network
- Differentiate traffic for virtual private networks (VPNs)

Directing Traffic Toward Special Local Content

Figure 17 shows an example of a cable modem network. Multiple cable modem termination systems (CMTSs) connect to multiple shared media access LANs. Many subscribers connect to each LAN.

In this example, the service provider uses subscriber interfaces to direct traffic toward special local content on the network: a voice over Internet Protocol (VoIP) service on network 10.11.0.0/16, or a local gaming service on network 10.12.0.0/16. Rate limits and policies on the subscriber interface customize the service level for the associated service. In this application, the E-series router is the first-hop router for the subscribers, and the subscriber interfaces demultiplex traffic based on the destination address.

Figure 17: Subscriber Interfaces in a Cable Modem Network



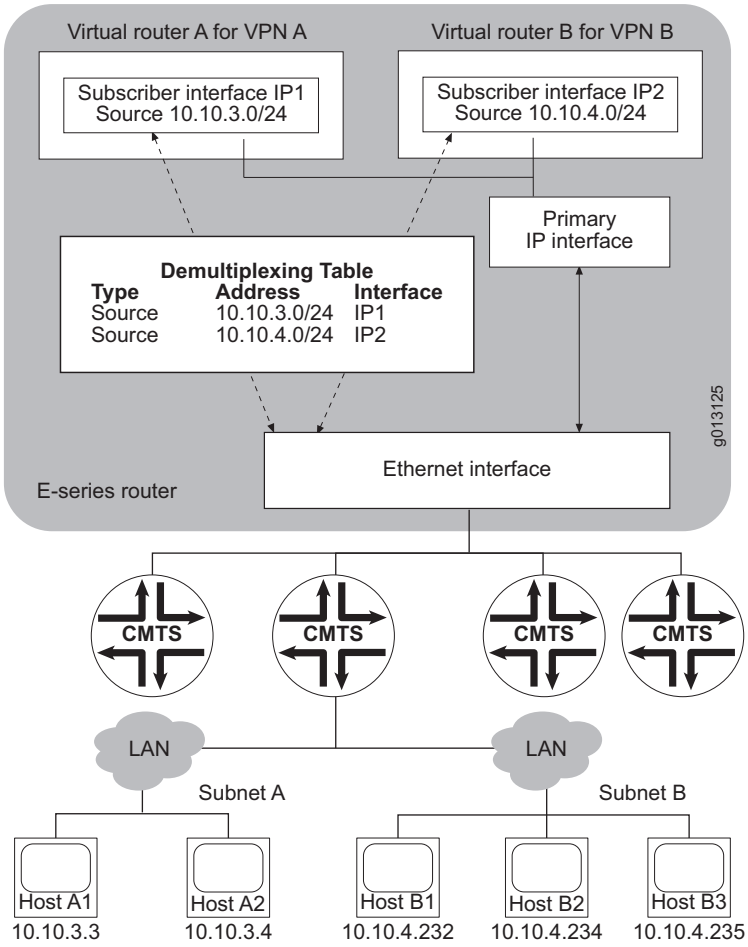
For instructions on configuring the application shown in Figure 17, see *Using a Destination Address to Demultiplex Traffic* on page 521.

Differentiating Traffic for VPNs

Similarly, service providers can use subscriber interfaces to differentiate traffic for VPNs. Figure 18 on page 514 shows an example of this application.

Customers on subnet A need to connect to VPN A, and customers on subnet B need to connect to VPN B. The E-series router connects to VPN A through virtual router A and to VPN B though virtual router B. Using two subscriber interfaces on the same primary interface (one on virtual router B and one on virtual router A), the E-series router can separate the traffic from subnets A and B. Because the E-series router is forwarding traffic in this application, the shared IP interface should demultiplex the traffic by using a source address.

Figure 18: Associating Subnets with a VPN Using Subscriber Interfaces



For instructions on configuring the application shown in Figure 18, see *Using a Source Address to Demultiplex Traffic* on page 524.

Platform Considerations

For information about modules that support subscriber interfaces on the ERX-7xx models, ERX-14xx models, and the ERX-310 router:

- See *ERX Module Guide, Table 1, ERX Module Combinations* for detailed module specifications.
- See *ERX Module Guide, Appendix A, Module Protocol Support* for information about the modules that support subscriber interfaces.

For information about modules that support subscriber interfaces on the E120 router and the E320 router:

- See *E120 and E320 Module Guide, Table 1, Modules and IOAs* for detailed module specifications.
- See *E120 and E320 Module Guide, Appendix A, IOA Protocol Support* for information about the modules that support subscriber interfaces.

Interface Specifiers

The configuration task examples in this chapter use the *slot*/*port* format to specify an interface. However, the interface specifier format that you use depends on the router that you are using.

For ERX-7xx models, ERX-14xx models, and ERX-310 routers, use the *slot*/*port* format. For example, the following command specifies a Gigabit Ethernet interface on slot 0, port 1 of an ERX-7xx model, ERX-14xx model, or ERX-310 router.

```
host1(config)#interface gigabitEthernet 0/1
```

For E120 and E320 routers, use the *slot*/*adapter*/*port* format, which includes an identifier for the bay in which the I/O adapter (IOA) resides. In the software, adapter 0 identifies the right IOA bay (E120 router) and the upper IOA bay (E320 router); adapter 1 identifies the left IOA bay (E120 router) and the lower IOA bay (E320 router). For example, the following command specifies a Gigabit Ethernet interface on slot 5, adapter 0, port 0 of an E320 router.

```
host1(config)#interface gigabitEthernet 5/0/0
```

For more information about supported interface types and specifiers on E-series routers, see *Interface Types and Specifiers* in *JUNOSe Command Reference Guide, About This Guide*.

References

For more information about the DHCP local server and DHCP external server, which are used in dynamic creation of subscriber interfaces, consult the following resources:

- *Chapter 17, DHCP Overview*
- RFC 2131—Dynamic Host Configuration Protocol (March 1997)

Dynamic Creation of Subscriber Interfaces

As an alternative to creating static subscriber interfaces, you can configure E-series routers to create subscriber interfaces dynamically.

When you create a static subscriber interface, as described in *Configuring Static Subscriber Interfaces* on page 521, each layer in the interface stack is created through an existing configuration mechanism such as command-line interface (CLI) or Simple Network Management Protocol (SNMP).

By contrast, the router creates dynamic subscriber interfaces on demand, in response to an external event. Two types of external events can cause dynamic creation of subscriber interfaces: when an Dynamic Host Configuration Protocol (DHCP) event occurs or when the router detects a packet.

DHCP Servers

The DHCP event that triggers dynamic creation of subscriber interfaces occurs when either a local DHCP server or external DHCP server assigns an IP address to a subscriber that has issued a DHCP request. After the DHCP server assigns the IP address and the router creates the associated dynamic subscriber interface, the subscriber can access required network services.

DHCP Local Server and Address Allocation

You can configure the DHCP local server to operate in either equal-access mode or standalone mode.

In standalone mode, the DHCP local server provides a basic DHCP service. The server receives a client request for an IP address and immediately allocates the subscriber an IP address from one of the local address pools.

In equal-access mode, the DHCP local server works with Juniper Networks Session and Resource Control (SRC) software and the authorization, accounting, and address assignment utility to provide an advanced subscriber configuration and management service. After the subscriber is authenticated through RADIUS, the DHCP server assigns the subscriber an IP address with a long lease time. This assignment of an IP address triggers the creation of dynamic subscriber interfaces.

For more information about the DHCP servers and the SRC software, see the following chapters:

- *Chapter 17, DHCP Overview*
- *SRC-PE Getting Started Guide*, *Chapter 1*, *SRC Product Overview*

DHCP External Server and Address Allocation

With DHCP external server, all communication between the subscriber and the DHCP server is monitored by the E-series router. The subscriber requests an address from the DHCP server through the E-series router. After the subscriber receives an IP address, the subscriber can access the Internet and use the value-added services provided by the E-series router and by the SRC software. The edge network must be using a DHCP relay function.

The services provided by integrating the E-series router's DHCP external server application with SRC software are similar to those provided when the DHCP local server is integrated with SRC software. For more information, see *SRC-PE Getting Started Guide*, *Chapter 1*, *SRC Product Overview*.

DHCP Relay Configuration

When you are configuring dynamic subscriber interface support, and you configure DHCP relay in the same virtual router as the dynamic subscriber interfaces, you must use the **set dhcp relay inhibit-access-route-creation** command to ensure that DHCP replay does not install access internal routes. Otherwise, DHCP relay will overwrite the access internal routes that are originally created for the subscriber interface.

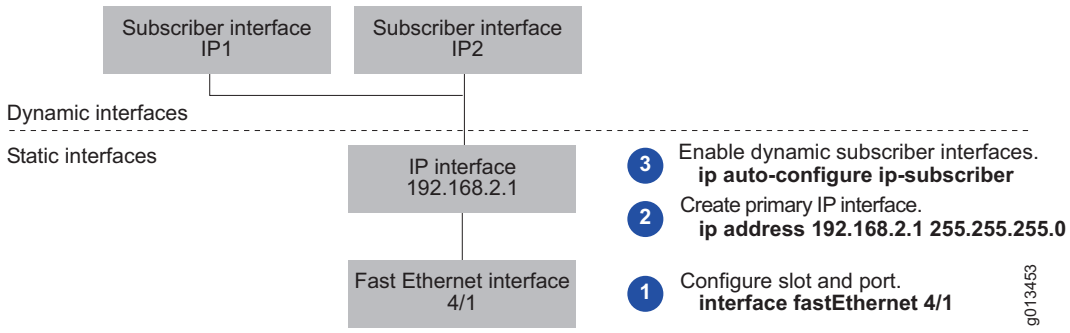
Supported Configurations

E-series routers currently support dynamic creation of subscriber interfaces with DHCP servers in the following configurations:

- IP over Ethernet
- IP over VLAN over Ethernet
- IP over bridged Ethernet over ATM

For example, Figure 19 shows the interface stacking in an IP over Ethernet dynamic subscriber interface configuration. The illustration indicates which layers in the stack are static and dynamic, and identifies the CLI commands typically used to create the configuration.

Figure 19: IP over Ethernet Dynamic Subscriber Interface Configuration



As shown in Figure 19, issuing the **ip auto-configure ip-subscriber** command configures the primary IP interface to enable dynamic creation of subscriber interfaces. However, the router does not actually create the dynamic subscriber interface until the DHCP server assigns an IP address to the associated subscriber.

To configure each supported configuration, see *Configuring Dynamic Subscriber Interfaces* on page 528.

Packet Detection

For GRE tunnel interfaces, the event that triggers dynamic creation of subscriber interfaces occurs when the router receives a packet with a source IP address that is not in the demultiplexer table. In this case, the primary IP interface must be in autoconfiguration mode.

Packet detection is the only method of dynamically creating subscriber interfaces on GRE tunnel interfaces; you cannot use DHCP local server or DHCP external server.

Issuing the **ip auto-configure ip-subscriber** command configures the primary IP address to enable dynamic configuration of subscriber interfaces. Unlike DHCP configurations, the router creates the dynamic subscriber interface when it receives the first packet that contains the subscriber's IP address as the source address.

In addition, a dynamic subscriber interface becomes inactive after a period of time in which the router receives no packets that contain the subscriber's IP address as the source address. You can configure the period of time by issuing the **ip inactivity-timer** command.

To configure dynamic creation of subscriber interfaces on GRE tunnel interfaces, see *Configuring Dynamic Subscriber Interfaces* on page 528.

Designating Traffic for the Primary IP Interface

When dynamic creation of subscriber interfaces is enabled on the primary IP interface (by means of the **ip auto-configure ip-subscriber** command), you can use the **ip source-prefix** command to specify the source address of traffic that is destined for the primary IP interface instead of the subscriber interface. If the DHCP server (for DHCP server configurations) or the router (for packet detection configurations) then assigns a subscriber an IP address matching this source prefix, the router does not create a dynamic subscriber interface for that address.

Using Framed Routes

You can use the **ip use-framed-routes ip-subscriber** command to enable a primary IP interface to use framed routes as source IP addresses when creating dynamic subscriber interfaces. The framed routes are applied to the dynamic subscriber interface during configuration so traffic from the subsets can traverse the interface. By applying framed routes in this fashion, you can extend the per-subscriber interface management to any subnetworks behind the dynamic subscriber interface. RADIUS includes the Framed-Route attribute [22] in Access-Accept messages to specify the route in the following format:

Framed-Route = *ipAddress/mask nextHop*

Inheritance of MAC Address Validation State for Dynamic Subscriber Interfaces

A dynamic IP subscriber interface inherits the MAC address validation state (enabled or disabled) configured for its parent static primary IP interface.

MAC address validation binds a MAC source address for an interface to a given IP source address. When the IP-MAC binding is established, the router forwards ingress packets on the interface when the packet's MAC source address and IP source address match, and drops ingress packets when the packet's MAC source address and IP source address do not match. MAC address validation thereby prevents spoofing on IP-based Ethernet interfaces, and is very useful in subscriber management applications.

When MAC address validation is enabled on an interface, the router checks the entry in the MAC validation table that corresponds to the IP source address of an incoming packet. The MAC source address of the packet must match the MAC source address of the table entry for the router to forward the packet.

How MAC Address Validation State Inheritance Works

To enable MAC address validation for the static primary IP interface, you must use the existing **ip mac-validate** command with either the **strict** keyword or the **loose** keyword. The **strict** keyword prevents transmission of IP packets that do not reside in the MAC validation table. The **loose** keyword, which is the default setting, enables IP packets to pass through even when the packets do not have entries in the MAC validation table; only packets that have matching IP-MAC pair entries in the table are validated.

When a dynamic IP subscriber interface is created with the MAC address validation state inherited from the static primary IP interface, an entry for the MAC source address is installed in the MAC validation table when MAC address validation is enabled (either loose or strict) on the static primary IP interface. For each packet received on this interface, the router compares the packet's MAC source address to the value in the MAC validation table. If these values match, the router forwards the packet; otherwise, the packet is discarded.

In addition, creation of the dynamic IP subscriber interface adds a static MAC address validation entry in the router's Address Resolution Protocol (ARP) table. This occurs regardless of whether you configure MAC address validation on the static primary IP interface with the **ip mac-validate strict** command or the **ip mac-validate loose** command.

Configuration of MAC Address Validation State Inheritance

No special configuration is required to enable inheritance of the MAC address validation state on dynamic IP subscriber interfaces; this occurs automatically provided that MAC address validation is properly enabled on the parent static primary IP interface with the **ip mac-validate** command. If MAC address validation is disabled on the static primary IP interface, the dynamic subscriber interface inherits the disabled state for MAC address validation.

Keep the following guidelines in mind for using dynamic IP subscriber interfaces that inherit the MAC address validation state from their parent static primary IP interface:

- A dynamic subscriber interface inherits the MAC address validation state of its static primary IP interface only when the dynamic subscriber interface is created.
- You cannot change the MAC address validation state inherited by a dynamic subscriber interface from its static primary IP interface.
- Changing the MAC address validation state of a static primary IP interface does not affect the MAC address validation state of dynamic subscriber interfaces already created from this primary IP interface. Any dynamic subscriber interfaces created from this primary IP interface after you change the MAC address validation state inherit the new MAC validation state.
- When you configure a dynamic subscriber interface with one or more framed routes (subnets), we recommend that you use the **ip mac-validate loose** command to configure MAC address validation for the static primary IP interface. Using the **loose** keyword, which is the default, prevents the router from discarding packets with an IP source address from a subnet.
- Because enabling MAC address validation on an IP interface creates a static MAC address validation entry in the router's ARP table, be sure to observe the system limit for the maximum number of dynamic ARP table entries supported per line module. See the Link Layer Maximums tables in *Appendix A, System Maximums*, of the *Release Notes* corresponding to your software release for information about the maximum number of dynamic ARP entries that the router supports. Currently, this limit is set to 32,768 dynamic ARP entries for all E-series modules that support Ethernet interfaces.

Verification of MAC Address Validation State Inheritance

To verify inheritance of the MAC address validation state on a dynamic subscriber interface, you can use the **show ip mac-validate interface** command and the **show arp** command.

The following sample output from the **show ip mac-validate interface** command displays the MAC address validation state (strict) inherited by the dynamic subscriber interface ip74.39.64.3 from its parent static primary IP interface.

```
host1#show ip mac-validate interface ip74.39.64.3
ip74.39.64.3:  Strict

        Address       Hardware Addr
        74.39.64.3    0090.1a40.f4f6
```

Building on this example, the following sample output from the **show arp** command displays a static MAC address validation entry (74.39.64.3) in the ARP table for the dynamic subscriber interface when it is created with the MAC address validation state inherited from its parent static primary IP interface. The asterisk (*) indicates that the ARP entry was added as the result of issuing an **arp validate** command rather than an **arp** command.

```
host1#show arp
        Address          Age         Hardware Addr    Interface
      10.13.10.1       21600        0090.6939.751b    FastEthernet6/0
      74.39.64.3           -        0090.1a40.f4f6    ip74.39.64.3 *
     192.168.1.2       20700        0090.1a40.280d    FastEthernet8/2
```

Configuring Static Subscriber Interfaces

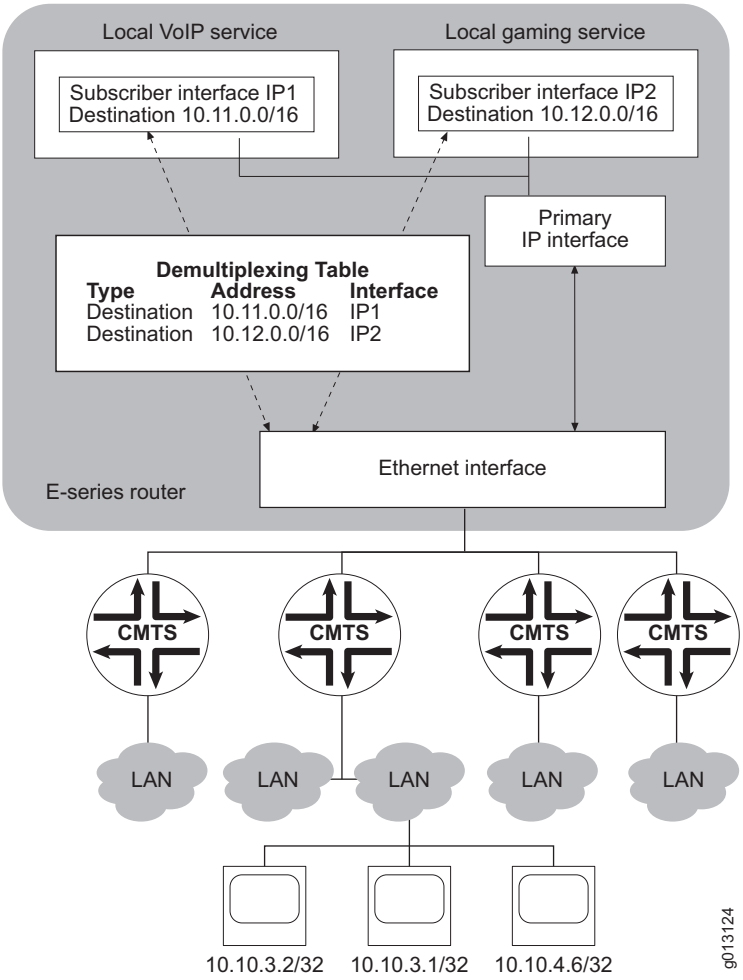
You can configure static subscriber interfaces on ATM, Fast Ethernet, Gigabit Ethernet, 10-Gigabit Ethernet, or POS layer 2 interfaces.

The examples in this section show how to configure static subscriber interfaces on a Fast Ethernet interface, but the steps for configuring static subscriber interfaces over other supported layer 2 interface types are similar.

Using a Destination Address to Demultiplex Traffic

The example in Figure 20 shows how you can use static subscriber interfaces to direct traffic toward special local content on the network, based on the traffic's destination address. In this application, a local VoIP service is on network 10.11.0.0./16, and a local gaming service is on network 10.12.0.0/16.

Figure 20: Subscriber Interfaces Using a Destination Address to Demultiplex Traffic



To configure the static subscriber interfaces shown in Figure 20, perform the following steps:

1. Configure a primary IP interface on a supported layer 2 interface.

   a. Create a layer 2 interface.

      host1(config)#**interface fastEthernet 3/1**

   b. Create a primary IP interface.

      host1(config-if)#**ip address 10.1.1.1 255.0.0.0**

   c. Configure the primary interface to use a destination address to demultiplex traffic. (By default, a source address is used to demultiplex traffic.)

      host1(config-if)#**ip demux-type da-prefix**

d. Exit Interface Configuration mode.

host1(config-if)#**exit**

2. Configure subscriber interface IP1.

a. Create the shared IP interface.

host1(config)#**interface ip ip1**

b. Associate the shared IP interface with the layer 2 interface by using one of the following methods:

- Static

host1(config-if)#**ip share-interface fastEthernet 3/1**

- Dynamic

host1:vr-a:vrf-1(config-if)#**ip share-nexthop 10.1.1.2**

c. To fully configure the shared interface, assign an address or make it unnumbered.

host1(config-if)#**ip unnumbered loopback 0**

d. Specify the destination addresses for the subscriber interface to use to demultiplex traffic.

host1(config-if)#**ip destination-prefix 10.11.0.0 255.255.0.0**

e. Exit Interface Configuration mode.

host1(config-if)#**exit**

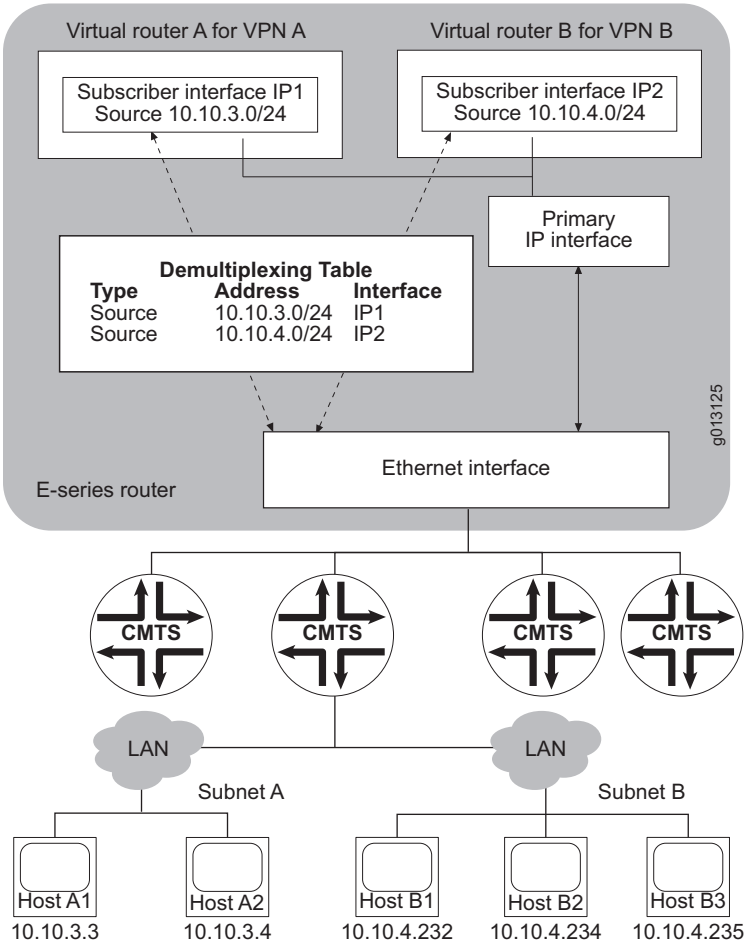
3. Repeat Step 2 to configure subscriber interface IP2.

host1(config)#**interface ip ip2**
host1(config-if)#**ip share-interface fastEthernet 3/1**
host1(config-if)#**ip unnumbered loopback 0**
host1(config-if)#**ip destination-prefix 10.12.0.0 255.255.0.0**

Using a Source Address to Demultiplex Traffic

Figure 21 shows how you can use static subscriber interfaces to differentiate traffic for VPN access, based on the traffic's source address.

Figure 21: Subscriber Interfaces Using a Source Address to Demultiplex Traffic



To configure the static subscriber interfaces shown in Figure 21, perform the following steps:

1. Configure a primary IP interface on a supported layer 2 interface.

   a. Create a layer 2 interface.

      host1(config)#**interface fastEthernet 4/1**

   b. Create a primary IP interface.

      host1(config-if)#**ip address 10.1.1.1 255.255.255.0**

   c. Exit Interface Configuration mode.

      host1(config-if)#**exit**

2. Configure subscriber interface IP1.

   a. Create the shared IP interface.

      host1(config)#**virtual-router vra**
      Proceed with new virtual-router creation? [confirm] **yes**
      host1:vra(config)#**interface ip ip1**

   b. Associate the shared IP interface with the layer 2 interface by using one of the following methods:

      - Static

      host1:vra(config-if)#**ip share-interface fastEthernet 4/1**

      - Dynamic

      host1:vra(config-if)#**ip share-nexthop 10.1.1.2**

   c. To fully configure the shared interface, assign an address or make it unnumbered.

      host1:vra(config-if)#**ip unnumbered loopback 0**

   d. Specify the source addresses for the subscriber interface to use to demultiplex traffic, then exit Interface Configuration mode.

      host1:vra(config-if)#**ip source-prefix 10.10.3.0 255.255.255.0**
      host1:vra(config-if)#**exit**

3. Create a static route that sends traffic for destination address 10.10.3.0 to subscriber interface IP1.

   host1:vra(config)#**ip route 10.10.3.0 255.255.255.0 ip ip1**

4. Repeat Step 2 to configure subscriber interface IP2.

   host1(config)#**virtual-router vrb**
   Proceed with new virtual-router creation? [confirm] **yes**
   host1:vrb(config)#**interface ip ip2**
   host1:vrb(config-if)#**ip share-interface fastEthernet 4/1**
   host1:vrb(config-if)#**ip unnumbered loopback 0**
   host1:vrb(config-if)#**ip source-prefix 10.10.4.0 255.255.255.0**
   host1:vrb(config-if)#**exit**

5. Create a static route that sends traffic for destination address 10.10.4.0 to subscriber interface IP2.

   host1:vrb(config)#**ip route 10.10.4.0 255.255.255.0 ip ip2**

6. Specify that DHCP relay does not install host routes—this avoids a conflict that can causes undesirable ARP behavior.

   host1(config)#**set dhcp relay inhibit-access-route-creation**

For details about the cause of this conflict and the use of the **set dhcp relay inhibit-access-route-creation** command to avoid the conflict, see *Preventing DHCP Relay from Installing Host Routes by Default* in *Chapter 20, Configuring DHCP Relay*.

interface ip

- Use to create an IP interface to share a layer 2 interface.
- Use the specified name to refer to the shared IP interface; you cannot use the layer 2 interface to refer to the shared IP interface, because the shared interface can be moved.
- Example

  host1(config)#**interface ip si0**

- Use the **no** version to delete the IP interface.

ip demux-type da-prefix

- Use to specify that the router use a destination address to demultiplex traffic for the subscriber interface.
- Example

  host1(config-if)#**ip demux-type da-prefix**

- Use the **no** version to restore the default situation in which the router uses a source address to demultiplex traffic.

ip destination-prefix

- Use to specify a destination address for a subscriber interface or for a primary IP interface.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example

  host1(config-if)#**ip destination-prefix 196.168.2.2 255.0.0.0**

- Use the **no** version to remove the association between the interface and the specified IP destination address and mask.

ip share-interface

- Use to specify the layer 2 interface for this IP interface to share. The command fails if the layer 2 interface does not yet exist.
- If you issue this command on a shared IP interface, you cannot issue the **ip share-nexthop** command for the interface.
- After creating the shared IP interface, you can configure it as you do any other IP interface.

- The shared interface is operationally up when the layer 2 interface is operationally up and IP is properly configured.
- You can create operational shared IP interfaces in the absence of a primary IP interface.
- Example

  host1(config-if)#**ip share-interface atm 5/3.101**

- Use the **no** version to remove the association between the layer 2 interface and the shared IP interface. You can delete shared and primary IP interfaces independently.

ip share-nexthop

- Use to specify that the shared IP interface dynamically tracks a next hop. If the next hop changes, the shared IP interface moves to the new layer 2 interface associated with the IP interface toward the new next hop.
- If you issue this command on a shared IP interface, you cannot issue the **ip share-interface** command for the interface.
- If you issue this command on a shared IP interface, the shared interface cannot dynamically track the next hop for the specified destination if the next-hop IP address is resolvable over MPLS.
- If you specify a virtual router, the command fails if the VR does not already exist. If you do not specify a VR, the current VR is assumed.
- After creating the shared IP interface, you can configure it as you do any other IP interface.
- The shared interface is operationally up when the layer 2 interface associated with the specified next hop is operationally up and IP is properly configured.
- Example

  host1(config-if)#**ip share-nexthop 192.168.10.16**

- Use the **no** version to halt tracking of the next hop.

ip source-prefix

- Use to specify a source address for a subscriber interface.
- On the ERX-1440 router or the E320 router, you can configure up to 1024 subnets for static subscriber interfaces per primary IP interface when each subnet has a variable network mask that is less than /32. The number of subnets identifying a single route (/32) is still limited by the global maximum of 16,000 hosts per line module.
- Example

  host1(config-if)#**ip source-prefix 192.168.0.0 255.0.0.0**

- Use the **no** version to remove the association between the interface and the specified IP source address and mask.

Configuring Dynamic Subscriber Interfaces

You can configure dynamic subscriber interfaces in the following configurations:

- IP over Ethernet
- IP over VLAN over Ethernet
- IP over bridged Ethernet over ATM
- GRE tunnels

The following sections describe how to create each of these basic configurations. In addition, *Dynamic Subscriber Interface Configuration Example* on page 532, provides a detailed sample configuration.

Configuring Dynamic Subscriber Interfaces over Ethernet

To configure a dynamic subscriber interface in an IP over Ethernet configuration by using DHCP events, perform the following steps:

1. Configure the DHCP server.

   For instructions, see *Configuring the DHCP Local Server* in *Chapter 19, Configuring DHCP Local Server*.

2. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface fastEthernet 4/1**

3. Create the primary IP interface by assigning an IP address and mask to the Ethernet interface (or make it unnumbered).

   host1(config-if)#**ip address 192.168.2.1 255.255.255.0**

4. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

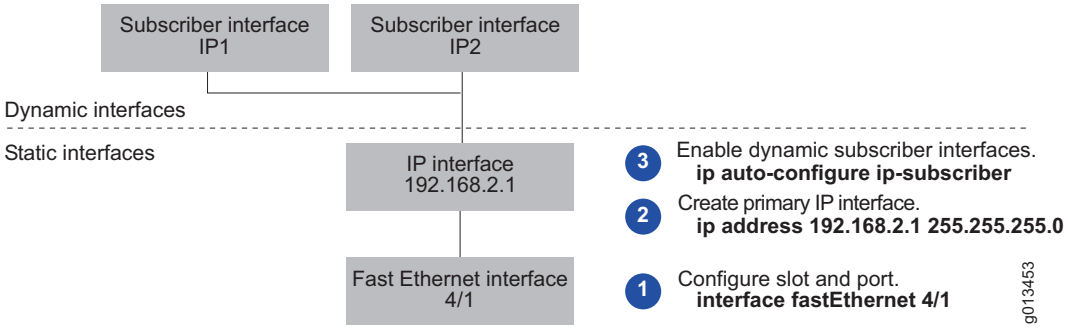
   host1(config-if)#**ip auto-configure ip-subscriber**

5. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-if)#**ip source-prefix 192.168.2.1 255.255.255.0**

Figure 22 shows the interface stack built for this configuration.

Figure 22: IP over Ethernet Dynamic Subscriber Interface Configuration



Configuring Dynamic Subscriber Interfaces over VLANs

To configure a dynamic subscriber interface in an IP over VLAN over Ethernet configuration by using DHCP events, perform the following steps:

1. Configure the DHCP server.

   For instructions, see *Configuring the DHCP Local Server* in *Chapter 19, Configuring DHCP Local Server*.

2. Specify a Fast Ethernet, Gigabit Ethernet, or 10-Gigabit Ethernet port.

   host1(config)#**interface gigabitEthernet 1/0**

3. Specify VLAN as the encapsulation method on the interface. This command creates the VLAN major interface.

   host1(config-if)#**encapsulation vlan**

4. Create a VLAN subinterface by adding a subinterface number to the interface identification command.

   host1(config-if)#**interface gigabitEthernet 1/0.1**

5. Assign a unique VLAN ID to the VLAN subinterface.

   host1(config-if)#**vlan id 101**

6. Create the primary IP interface by assigning an IP address and mask to the VLAN subinterface (or make it unnumbered).

   host1(config-if)#**ip address 192.168.2.10 255.255.255.0**

7. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

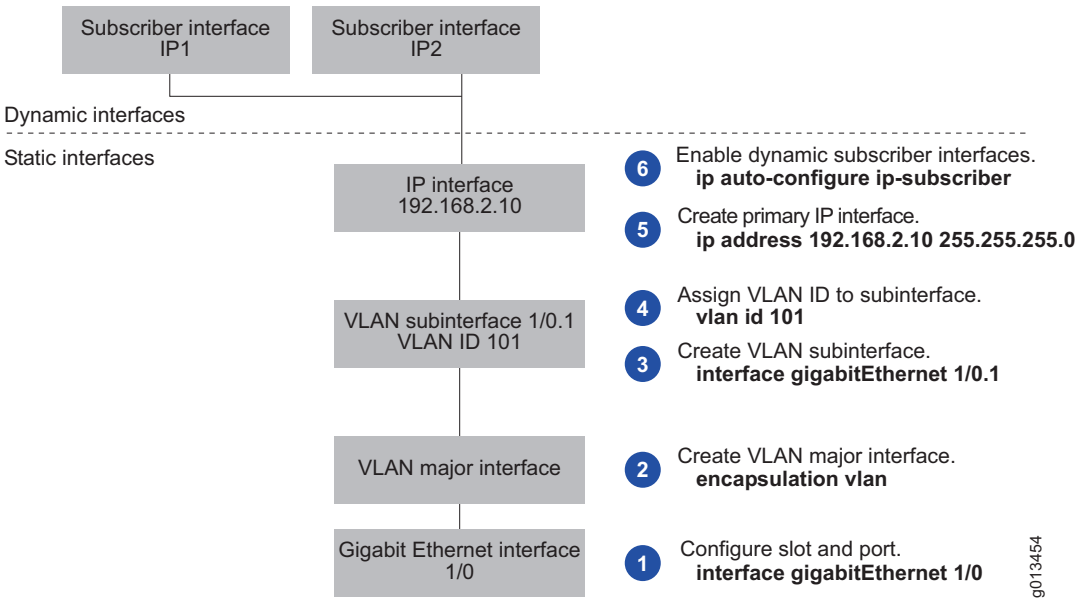
   host1(config-if)#**ip auto-configure ip-subscriber**

8. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-if)#**ip source-prefix 192.168.2.10 255.255.255.0**

Figure 23 on page 530 shows the interface stack built for this configuration.

Figure 23: IP over VLAN over Ethernet Dynamic Subscriber Interface Configuration



Configuring Dynamic Subscriber Interfaces over Bridged Ethernet

To configure a dynamic subscriber interface in an IP over bridged Ethernet over ATM configuration by using DHCP events, perform the following steps:

1. Configure DHCP server.

   For instructions, see *Configuring the DHCP Local Server* in *Chapter 19, Configuring DHCP Local Server*.

2. Create an ATM major interface.

   host1(config)#**interface atm 3/3**

3. Create an ATM 1483 subinterface.

   host1(config-if)#**interface atm 3/3.1**

4. Configure an associated PVC for the ATM 1483 subinterface by specifying the VCD, the VPI, the VCI, and the encapsulation type.

   host1(config-subif)#**atm pvc 10 100 22 aal5snap**

5. Specify bridged Ethernet as the encapsulation method on the ATM 1483 subinterface.

   host1(config-subif)#**encapsulation bridge1483**

6. Create the primary IP interface by assigning an IP address and mask to the bridged Ethernet interface (or make it unnumbered).

   host1(config-subif)#**ip address 192.168.2.20 255.255.255.0**

7. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

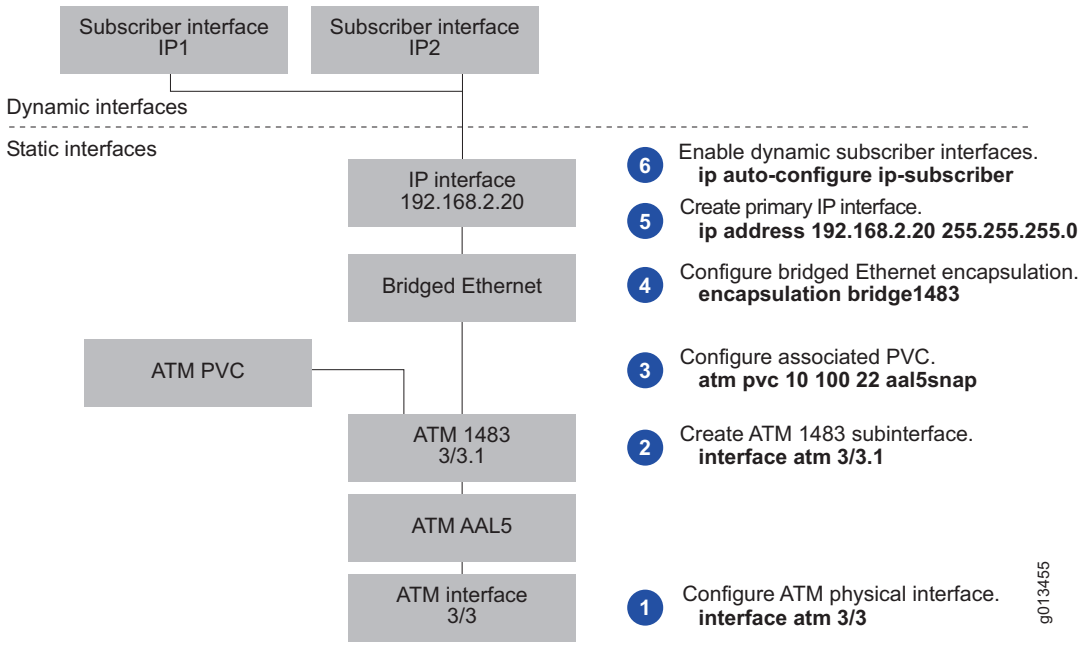
   host1(config-subif)#**ip auto-configure ip-subscriber**

8. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-subif)#**ip source-prefix 192.168.2.20 255.255.255.0**

Figure 24 shows the interface stack built for this configuration.

Figure 24: IP over Bridged Ethernet over ATM Dynamic Subscriber Interface Configuration



Configuring Dynamic Subscriber Interfaces over GRE Tunnels

To configure a dynamic subscriber interface in an GRE tunnel configuration by using packet detection, perform the following steps:

1. Create a GRE tunnel interface.

   For instructions, see *Configuration Tasks* in *JUNOSe IP Services Configuration Guide, Chapter 10, Configuring IP Tunnels*.

2. Create the primary IP interface by assigning an IP address and mask to the bridged Ethernet interface (or make it unnumbered).

   host1(config-subif)#**ip address 192.168.2.20 255.255.255.0**

3. Configure the packet detect feature and specify that IP automatically detect packets that do not match any entries in the demultiplexer table.

   host1(config-if)#**ip auto-detect ip-subscriber**

4. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

   host1(config-subif)#**ip auto-configure ip-subscriber**

5. (Optional) Specify the IP inactivity timer.

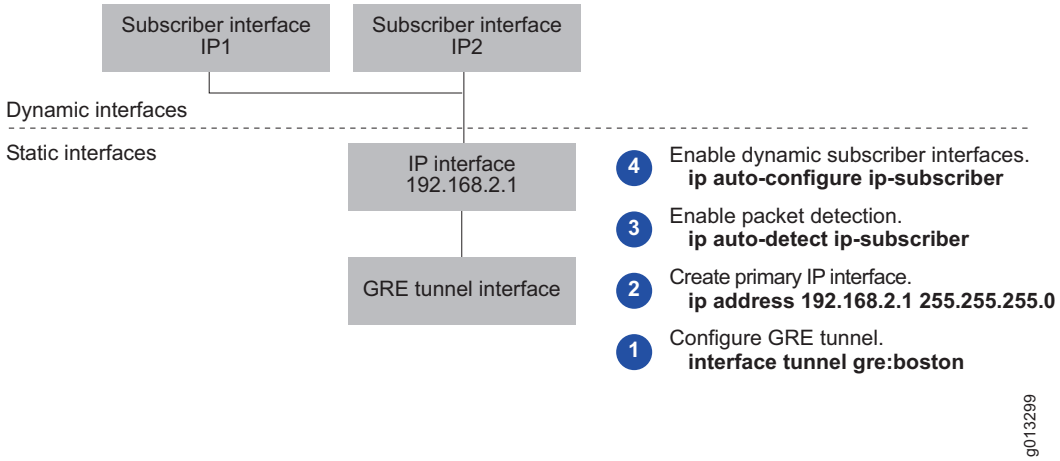
   host1(config-subif)#**ip inactivity-timer 100**

6. (Optional) Specify the source address of traffic that is destined for the primary IP interface.

   host1(config-subif)#**ip source-prefix 192.168.2.1 255.255.255.0**

Figure 25 shows the interface stack built for this configuration.

Figure 25: GRE Tunnel Dynamic Subscriber Interface Configuration



Dynamic Subscriber Interface Configuration Example

The procedure in this section shows how to configure dynamic subscriber interfaces by using the same loopback interface referenced by multiple unnumbered IP interfaces. Instead of assigning a different IP address to each physical interface, this example assigns an IP address to a loopback interface (loopback 0). Each physical interface is then configured as an unnumbered IP interface, referencing the same loopback interface. This example uses a DHCP local server.

This approach has the following benefits:

- A loopback interface provides a stable IP address that can minimize the impact if a physical interface in the network goes down.
- Unnumbered IP interfaces preserve valuable IP address space.

To configure dynamic subscriber interfaces, perform the following steps:

1. Enable the DHCP local server for standalone mode.

   host1(config)#**service dhcp-local standalone**

2. Access DHCP Local Pool Configuration mode for the local address pool.

   host1(config)#**ip dhcp-local pool ispWestford**

3. Specify the enduring IP addresses that the DHCP local server can assign from the local address pool.

   host1(config-dhcp-local)#**network 10.20.0.0 255.255.192.0**

4. Specify the router to forward traffic from the IP addresses to destinations on other subnets.

   host1(config-dhcp-local)#**default-router 10.20.32.1**

5. Exit DHCP Local Pool Configuration mode.

   host1(config-dhcp-local)#**exit**

6. Configure a loopback interface.

   host1(config)#**interface loopback 0**

7. Assign an IP address and mask to the loopback interface.

   host1(config-if)#**ip address 10.20.32.1 255.255.255.0**

8. Exit Interface Configuration mode.

   host1(config-if)#**exit**

9. Specify a Fast Ethernet port.

   host1(config)#**interface fastEthernet 3/0**

10. Create an unnumbered primary IP interface associated with the loopback interface configured in Steps 6 and 7.

    host1(config-if)#**ip unnumbered loopback 0**

11. Configure the primary IP interface to enable dynamic creation of subscriber interfaces.

    host1(config-if)#**ip auto-configure ip-subscriber**

12. Exit Interface Configuration mode.

    host1(config-if)#**exit**

13. Repeat Steps 9 through 12 for each Fast Ethernet interface on which you want to configure dynamic subscriber interfaces. For example:

    host1(config)#**interface fastEthernet 3/1**
    host1(config-if)#**ip unnumbered loopback 0**
    host1(config-if)#**ip auto-configure ip-subscriber**
    host1(config-if)#**exit**
    host1(config)#**interface fastEthernet 3/2**
    host1(config-if)#**ip unnumbered loopback 0**
    host1(config-if)#**ip auto-configure ip-subscriber**
    host1(config-if)#**exit**

atm pvc

- Use to configure a PVC on an ATM interface.
- Specify the VCD, the VPI, the VCI, and the encapsulation type. (For more information about these parameters, see *Creating a Basic Configuration* in *JUNOSe Link Layer Configuration Guide, Chapter 1, Configuring ATM*.)
- Example

  host1(config-subif)#**atm pvc 10 100 22 aal5snap**

- Use the **no** version to remove the specified PVC.

default-router

- Use to specify the IP address of the router for the subscriber's computer to use for traffic destined for locations beyond the local subnet.
- Specify the IP address of a primary server, and optionally, specify the IP address of a secondary server.
- Example

  host1(config-dhcp-local)#**default-router 10.10.1.1**

- Use the **no** version to remove the association between the address pool and the router.

encapsulation bridge1483

- Use to configure bridged Ethernet as the encapsulation method on an interface.
- Example

  host1(config-subif)#**encapsulation bridge1483**

- Use the **no** version to remove bridged Ethernet as the encapsulation method on the interface.

encapsulation vlan

- Use to configure VLAN as the encapsulation method on an interface.
- Issuing this command creates the VLAN major interface.
- Example

  host1(config-if)#**encapsulation vlan**

- Use the **no** version to disable VLAN encapsulation on the interface.

interface atm

- Use to configure an ATM interface or subinterface type in the *slot*/*port*.*subinterface* format:
  - *slot*—Specifies router chassis slot
  - *port*—Specifies I/O module port
  - *subinterface*—Specifies subinterface number
- Example

  host1(config-if)#**interface atm 9/1.1**

- Use the **no** version to remove the ATM interface or subinterface.

interface fastEthernet

- Use to select a Fast Ethernet (FE) interface on a line module or an SRP module.
- Example

  host1(config)#**interface fastEthernet 1/0**

- Use the **no** version to remove IP from an interface or subinterface. You must issue the **no** version from the highest level down; you cannot remove an interface or a subinterface if the one above it still exists.

interface gigabitEthernet

- Use to select a Gigabit Ethernet interface.

NOTE: You can configure only the primary port, 0, on the Gigabit Ethernet module. The router automatically uses the redundant port if the primary port fails.

- Example

  host1(config)#**interface gigabitEthernet 1/0**

- Use the **no** version to remove IP from an interface. You must issue the **no** version from the highest level down; you cannot remove an interface or a subinterface if the one above it still exists.

interface tenGigabitEthernet

- Use to select a 10-Gigabit Ethernet interface on the E120 router or the E320 router.
- Use the *slot/adapter/port* format.
- Example

  host1(config)#**interface tenGigabitEthernet 4/0/1**

- Use the **no** version to remove IP from an interface. You must issue the **no** version from the highest level down; you cannot remove an interface or subinterface if the one above it still exists.

interface loopback

- Use to access and configure a loopback interface.
- You can use a loopback interface to provide a stable IP address that can minimize the impact if a physical interface goes down.
- Example

  host1(config)#**interface loopback 10**
  host1(config-if)#**ip address 10.20.32.1 255.255.255.0**

- Use the **no** version to delete the loopback interface.

ip address

- Use to set an IP address for an interface or a subinterface.
- Specify the layer 2 encapsulation before you set the IP address.
- Issuing this command creates the primary IP interface. You must create a primary IP interface on which to enable dynamic creation of subscriber interfaces.
- Example

  host1(config-subif)#**ip address 192.168.2.50 255.255.255.0**

- Use the **no** version to remove the IP address or to disable IP processing.

ip auto-configure ip-subscriber

- Use to configure an IP interface to support creation of dynamic subscriber interfaces. The specified IP interface is considered the primary interface.
- The router creates the required dynamic subscriber interfaces when the IP address is assigned to the associated subscriber. The address might be assigned by an external DHCP server, the DHCP local server, or the packet detect feature.
- Use the **include-primary** keyword to specify that the primary interface can be assigned to a subscriber. Use the **exclude-primary** keyword to specify that the primary interface is not used for subscribers. The primary interface is not assigned to a subscriber by default.
- You can issue this command from Interface Configuration mode, Subinterface Configuration mode, or Profile Configuration mode.

- Example

  host1(config-if)#**ip auto-configure ip-subscriber include-primary**

- Use the **no** version to disable creation of dynamic subscriber interfaces associated with this primary IP interface. Use the **no** version with the **include-primary** keyword to specify that the primary interface is not assigned to a subscriber.

ip auto-detect ip-subscriber

- Use to set the router's packet detect feature and specify that IP automatically detect packets that do not match any entries in the demultiplexer table. When an unmatched packet is detected, an event is generated that determines whether to create a dynamic subscriber interface.
- Example

  host1(config-if)#**ip auto-detect ip-subscriber**

- Use the **no** version to restore the default, in which packet detection is disabled.

ip dhcp-local pool

- Use to access DHCP Local Pool Configuration mode.
- The DHCP local server uses pool names other than default to maintain configuration information for subscribers to a particular domain.
- Example

  host1(config)#**ip dhcp-local pool ispBoston**

- Use the **no** version to prevent the DHCP local server from supplying IP addresses from the specified pool.

ip inactivity-timer

- Use to configure the inactivity timer value. A dynamically created subscriber interface is deleted if it is inactive for a period longer than the inactivity timer value.
- The timer value can be in the range 1–65335 minutes.
- A timer value of 0 specifies that dynamically created subscriber interfaces are never deleted by the inactivity timer.
- Example

  host1(config-if)#**ip inactivity-timer 100**

- Use the **no** version to restore the default, in which inactivity timer feature is disabled.

ip source-prefix

- Use to configure a subscriber interface or a primary IP interface enabled for dynamic creation of subscriber interfaces to demultiplex traffic with the specified source address.
- You can issue this command from either Interface Configuration mode or Subinterface Configuration mode.
- Example

  host1(config-if)#**ip source-prefix 10.10.2.0 255.255.255.0**

- Use the **no** version to remove the association between the interface and the specified IP source address and mask.

ip unnumbered

- Use to configure an unnumbered IP interface.
- This command enables IP processing on an interface without assigning an explicit IP address to the interface.
- You must specify an interface location, which is the identifier of another interface on which the router has an assigned IP address. This interface cannot be another unnumbered interface.
- Examples

  host1(config-if)#**ip unnumbered fastEthernet 3/0**
  host1(config-if)#**ip unnumbered loopback 10**

- Use the **no** version to disable IP processing on the interface.

ip use-framed-routes ip-subscriber

- Use to configure a static primary IP interface to use framed routes as source IP addresses when creating dynamic subscriber interfaces. The router uses the Framed-Route RADIUS attribute [22] sent in Access-Accept messages to apply framed routes to subscriber interfaces associated with the primary interface.
- Example

  host1(config-if)#**ip use-framed-routes ip-subscriber**

- Use the **no** version to disable the use of framed routes when creating dynamic subscriber interfaces associated with this primary IP interface.

network

- Use to specify the IP addresses that the DHCP local server can provide from an address pool.
- Example

  host1(config-dhcp-local)#**network 10.10.1.0 255.255.255.0**

- Use the **no** version to remove the network address and mask.

service dhcp-local

- Use to enable the DHCP local server to operate in either equal-access mode or standalone mode.
- Example

  host1(config)#**service dhcp-local standalone**

- Use the **no** version to disable the DHCP local server.

set dhcp relay giaddr-selects-interface

- Use to configure DHCP relay to use information in the giaddr in DHCP server-destined packets to identify the primary interface on which dynamic subscriber interfaces are built. See *Using the Giaddr to Identify the Primary Interface for Dynamic Subscriber Interfaces* in *Chapter 20, Configuring DHCP Relay* for additional information about this feature.
- Example

  host1(config)#**set dhcp relay giaddr-selects-interface**

- Use the **no** version to restore the default in which DHCP relay builds dynamic subscriber interfaces on the IP interface that is used for DHCP server-destined messages.

vlan id

- Use to configure a VLAN ID for a VLAN subinterface.
- Specify a VLAN ID number that is in the range 0–4095 and is unique within the Ethernet interface.
- Issue the **vlan id** command before you configure any upper-layer interfaces, such as IP.
- Example

  host1(config-if)#**vlan id 400**

- There is no **no** version.

Chapter 26

Monitoring Subscriber Interfaces

This chapter describes how to monitor static and dynamic subscriber interfaces for remote access to the E-series router. This chapter contains the following sections:

Monitoring Subscriber Interfaces Overview

The state of the subscriber interface is determined by state of the Ethernet interface and the existence of the primary IP interface, which you can monitor with the **show ip interface** command. For information about using the **show ip interface** command, see *Monitoring IP* in *JUNOSe IP Services Configuration Guide, Chapter 1, Configuring IP*.

You can use the **show ip demux interface** command to monitor the configuration of subscriber interfaces.

Monitoring Subscriber Interfaces

Purpose Display information about subscriber interfaces.

Action To display subscriber interface information:

```
host1#show ip demux interface fastEthernet 2/0
Prefix/Length      SA/DA  Subscriber-Intf  VR/VRF        Description
10.12.2.2/32       SA     ip subsc1       3             subsc1@test
10.12.2.3/32       SA     ip subsc2       3             subsc2@test
10.12.2.4/32       SA     ip subsc3       3             subsc3@test
10.12.2.5/32       SA     ip subsc4       3             subsc4@test
```

Meaning Table 128 lists the **show ip demux interface** command output fields.

Table 128: show ip demux interface Output Fields

Field Name	Field Description
Prefix/Length	Source or destination addresses that the subscriber interface demultiplexes

Table 128: show ip demux interface Output Fields (continued)

Field Name	Field Description
SA/DA	Demultiplexing method for subscriber interface
SA	Source address
DA	Destination address
Subscriber-Intf	Name of shared interface on which subscriber interface is configured
VR/VRF	Name of virtual router (VR) or VPN routing and forwarding (VRF) instance on which the subscriber interface is configured
Description	Text description for the IP interface on which subscriber interface is configured (added with the **ip description** command)

Related Topics

- **show ip demux interface** command

Monitoring Active IP Subscribers Created by Subscriber Management

Purpose Display information about active IP subscribers that were created by the JUNOSe software's subscriber management feature.

Action To display information about subscribers that were created by subscriber management:

```
host1#show ip-subscriber 2835349506

                                        Virtual
    Id         User Name      Ip Address    Router      Interface
----------   --------------   -----------   -------   -------------
2835349506   user1@isp1.com   192.168.0.1   default   ip192.168.0.1

    Id         Login time
----------   ------------------------
2835349506   WED AUG 23 20:46:24 2006

host1#show ip-subscriber detail

                           Subscriber List
                           ---------------
                                        Virtual
    Id         User Name      Ip Address    Router      Interface
----------   --------------   -----------   -------   -------------
2835349506   user1@isp1.com   192.168.0.1   default   ip192.168.0.1

                                                        Profile
    Id              Login Time           Mac Address     Handle
----------   ------------------------   --------------   --------
2835349506   WED AUG 23 20:46:24 2006   3000.0001.9365   13631489

             Interface   Service
    Id        Profile    Profile        Option 82
----------   ---------   ---------   ----------------
2835349506   myProfile   profile22   FastEthernet 3/1
```

Meaning Table 129 lists the **show ip-subscriber** command output fields.

Table 129: show ip-subscriber Output Fields

Field Name	Field Description
Id	ID of the subscriber
User Name	Username used to retrieve information from RADIUS for the subscriber interface
Ip Address	IP address of the subscriber interface
Virtual Router	Name of the virtual router on which the subscriber interface is configured
Interface	Name of subscriber interface; **ip** indicates that subscriber manager created this interface
Login Time	Day, date, and time that the subscriber logged in
Mac Address	MAC address of the subscriber
Profile Handle	AAA profile handle
Interface Profile	Interface profile name used to configure the subscriber interface
Service Profile	IP service profile name used by subscriber management to authorize and configure the subscriber interface with AAA
Option 82	DHCP relay agent information (option 82) circuit identifier that describes the physical interface location associated with the subscriber

Related Topics

- **show ip-subscriber** command

Part 6

Managing Subscriber Services

Chapter 27

Configuring Service Manager

This chapter describes how to use the Service Manager application to define, activate, and monitor networking services for your subscribers. This chapter discusses the following topics:

Overview

The JUNOSe Service Manager application provides authentication, service selection, and service activation and deactivation to subscribers. The application also collects accounting information and statistics, and monitors subscriber and service sessions.

Service Manager supports two client types—RADIUS and CLI. Service Manager starts when it receives a request from a RADIUS or CLI client. For RADIUS clients, RADIUS Access-Accept messages and Change-of-Authorization-Request (CoA-Request) messages can create and delete Service Manager subscriber sessions and activate and deactivate service sessions. For CLI clients, CLI commands create and delete the subscriber sessions and activate and deactivate service sessions.

A subscriber's service is based on a service definition — service definitions can include profiles, policies, and quality of service (QoS) settings that define the scope of a service granted to the subscriber. Service definitions can also specify statistics configurations.

Service Manager provides convenience and flexibility to both service providers and subscribers.

- Providers are able to separate services and access technology and also to eliminate unprofitable flat-rate billing. They gain the ability to efficiently design, manage, and deliver services that subscribers want, and then bill subscribers based on connect time, bandwidth, and the actual service used.

- Subscribers benefit by gaining access to multiple simultaneous services—subscribers can dynamically connect to and disconnect from the services, when they want and for how long they want. They are billed based on the service type and usage, rather than being charged a set rate regardless of usage.

Service Manager Terms and Acronyms

Table 130 defines terms and acronyms that are used in this discussion of the Service Manager application.

Table 130: Service Manager Terms and Acronyms

Term	Definition
Guided entrance	A service that creates a controlled Internet browsing environment by transparently directing the subscriber to a specific Web site. At the Web site, the subscriber is presented with a selection of available services. Also called *walled gardens* or *captive portals*.
Macro language	The JUNOSe macro language that you use for service definitions
Mutex service	A service session that is part of a mutex group—the service definition for the service includes the mutex-group attribute.
RADIUS login method	The method that uses RADIUS VSAs in the Access-Accept packet to create a subscriber session and activate a service session when the subscriber logs in

Table 130: Service Manager Terms and Acronyms (continued)

Term	Definition
RADIUS CoA method	The method that uses RADIUS CoA-Request messages and VSAs to create a subscriber session and activate a service session for a subscriber that is already logged in
Service definition	A macro file that defines a named parameterized description of a service; used to create a service instance and the resulting subscriber service session; can include a combination of parameters such as policy lists, rate-limit profiles, QoS profiles, and interface profiles
Service instance	An instance that is created when you specify parameter values for a service definition to create a service session
Service session	A session that is created when a service instance is activated for a subscriber; a subscriber can have multiple active service sessions
Service session profile	A provider-configured profile that applies optional attributes to a service session; CLI only

Platform Considerations

Service Manager is supported on all E-series routers. For information about the modules supported on E-series routers:

- See the *ERX Module Guide* for modules supported on ERX-7xx models, ERX-14xx models, and the ERX-310 router.
- See the *E120 and E320 Module Guide* for modules supported on the E120 router and the E320 router.

References

For more information about the topics covered in this chapter, see the following documents:

- Data-Over-Cable Service Interface Specifications (DOCSIS) 2.0 Radio Frequency Interface Specification CM-SP-RFIv2.0-I10-051209.
- For information about using the JUNOSe software's macro language, see *JUNOSe System Basics Configuration Guide, Chapter 10, Writing CLI Macros*.
- For information about setting up policy-based routing features for Service Manager, such as rate-limit profiles, classifier control lists, policy lists, and hierarchical and merged policies, see the *JUNOSe Policy Management Configuration Guide*.
- For information about creating QoS profiles and QoS parameters, see the *JUNOSe Quality of Service Configuration Guide*.
- For information about creating IPv4 interface profiles, see *JUNOSe IP, IPv6, and IGP Configuration Guide, Chapter 1, Configuring IP*.

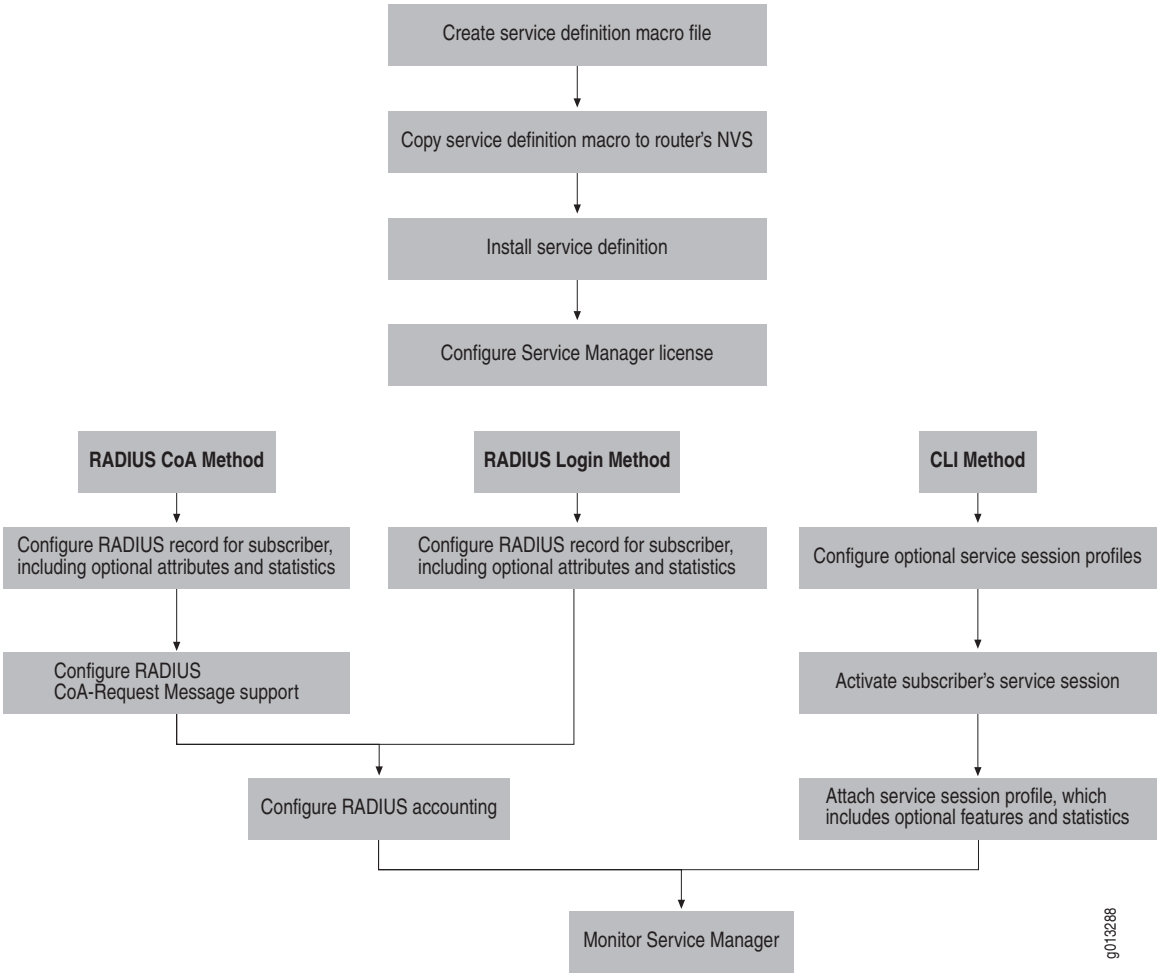
Configuration Tasks

To use the Service Manager application to create subscriber service sessions, you perform the following tasks:

- Create and manage service definitions
  - Use the macro language to define service definitions
  - Download service definition macro files to the router's nonvolatile storage (NVS)
  - Install service definitions on the router
  - Uninstall service definitions
- Configure the Service Manager license
- Configure RADIUS accounting
- Use RADIUS login and RADIUS CoA to manage subscriber service sessions
  - Specify the subscriber
  - Specify optional attributes
  - Enable statistics collection
  - Activate the service session
  - Deactivate service sessions
  - (Optional for RADIUS CoA method) Configure the CoA feature for the RADIUS dynamic-request server
- Use the CLI to manage subscriber service sessions
  - Specify the subscriber
  - Create and apply optional service session profiles
  - Enable statistics collection
  - Activate the service session
  - Deactivate service sessions

Figure 26 shows the sequence of operations you use to create and monitor subscriber service sessions.

Figure 26: Service Manager Configuration Flowchart



Service Definitions

A service definition is a high-level, platform-independent template that defines a service that you want to let your subscribers use. You use the JUNOSe software's embedded macro language on your computer to create the macro file that defines the service. You copy and install the macro file on the E-Series router, and then you can associate the service definition with subscribers to create their service sessions.

Service definitions gives you flexibility by enabling you to use:

- A single service definition to create a service for multiple subscribers.
- Parameterized service definitions to create variations of a service definition.
- Different service definitions to create multiple services for a single subscriber.

A service definition might use the following types of JUNOSe objects to define the characteristics and capabilities of the service you want to provide:

- Interface profiles—Specify a set of characteristics that can be dynamically assigned to IP interfaces. A service definition must use at least one interface profile.
- Policy lists—Specify policy actions for traffic traversing an interface.
- Classifier lists—Specify the criteria by which the router defines a packet flow.
- Rate-limit profiles—Specify a set of bandwidth attributes and associated actions that limit a classified packet flow or a source interface to a rate that is less than the physical rate of the port.
- QoS parameters—Specify attributes such as shaping rate, shared-shaping rate, assured rate, and scheduler weight for scheduler nodes and queues.
- QoS profiles—Specify queue, drop statistics gathering, and scheduler configuration for an interface hierarchy.

Creating Service Definitions

To create a service definition, you use the JUNOSe software's macro language to specify the parameters that define the desired service. A macro file can define only one service—however, the file can have multiple templates to define characteristics of the desired service. You create service definitions independent of the Service Manager commands and operations, which are performed on the E-series router.

For detailed information about the JUNOSe software's macro language, see *JUNOSe System Basics Configuration Guide, Chapter 2, Command-Line Interface*.

Figure 27 is an example of a service definition macro file that creates a tiered service. A tiered service typically provides set bandwidths for both inbound and outbound traffic for a subscriber. In this example, the input (inputBW) and output (outputBW) bandwidth values are parameterized. This example assumes that QoS profile triplePlayIP and QoS parameter maxSubscBW are configured. See *Service Definition Examples* on page 589 for additional service definition examples.

Service Manager only tracks JUNOSe objects that are passed back in the env.setResult method when a service definition is executed. Table 131 describes the supported objects:

Table 131: JUNOSe Objects Tracked by Service Manager

Name	Requirement	Description
input-stat-clacl	Optional	■ Collects input statistics from policy manager ■ Can be a list of clacls
secondary-input-stat-clacl	Optional	■ Collects input statistics from policy manager ■ Can be a list of clacls
output-stat-clacl	Optional	■ Collects output statistics from policy manager ■ Can be a list of clacls

Table 131: JUNOSe Objects Tracked by Service Manager (continued)

Name	Requirement	Description
activate-profile	Required	■ Specifies the interface profile used on activation of the service ■ Deletion of the profile is Service Manager's responsibility
deactivate-profile	Optional	■ Specifies the interface profile used on deactivation of the service ■ If not specified, is the same as the activation-profile ■ Deletion of the profile is Service Manager's responsibility
command-in-error	Optional	■ Passes the value env.getErrorCommand ■ Service Manager displays the line in the service definition that has the error
command-error-status	Optional	■ Passes the value env.getErrorStatus ■ Service Manager displays the error status for the error

Figure 27: Sample Service Definition Macro File

```
!parameterizes input and output bandwidth
<# tiered(inputBW, outputBW) #>

<# uid := app.servicemanager.getUniqueId #>
<# name := "SM-tiered-" $ uid #>
<# oname := "SM-O-tiered-" $ uid #>


classifier-list matchAll ip any any
rate-limit-profile <# name #> one-rate
    committed-rate <# inputBW; '\n' #>

policy-list <# name; '\n' #>
    classifier-group matchAll precedence 10000
        rate-limit-profile <# name; '\n' #>
        traffic-class best-effort

policy-list <# oname; '\n' #>
    classifier-group matchAll precedence 10000
        traffic-class best-effort

profile <# name; '\n' #>
    ip policy secondary-input <# name #> statistics enabled merge
    ip policy output <# oname #> statistics enabled merge
    qos-profile triplePlayIP
    qos-parameter maxSubscBW <# outputBW; '\n' #>

<# env.setResult("activate-profile", name) #>
<# env.setResult("secondary-input-stat-clacl", "matchAll") #>
<# env.setResult("output-stat-clacl", "matchAll") #>

<# endtmpl #>
```

Managing Your Service Definitions

After you have created the macro file for your service definition, you can perform the following operations with the service definition macro file:

1. Copy—You must copy the service definition from the local computer that you used to create the macro file to the router's NVS card.

2. Install—You must install the service definition before you can use it to create a service session. During installation, Service Manager precompiles the definition and extracts the definition file's timestamp. Precompiling the service definition improves Service Manager performance. The timestamp enables the Service Manager application to track any modifications you might make while the definition is being used.

3. Uninstall—You can uninstall a service definition file, for example, if you no longer want to use that definition. When you uninstall a service definition file, any existing service sessions that were activated using the original service definition continue to use the original definition until you deactivate the service session.

4. Modify—You can update an existing service definition file at any time. To update a service definition file:

   a. Use your text editor on your computer to make changes to the original service definition file.

   b. Copy the updated service definition file back to your router's NVS—this overwrites the original file on the router.

   c. Install the new service definition file.

   All new service sessions will be activated using the new service definition. Any existing service sessions that were activated using the original service definition continue to use the original definition until you deactivate the service session.

copy

- Use to copy a service definition macro file from your computer to the router's NVS.
- Specify the directory containing the macro file you want to copy and the name you want to use for the file in NVS.
- Example

  host1#**copy boston:/serviceDefs/triplePlay/tiered.mac tiered.mac**

- There is no **no** version.

service-management install

- Use to install or uninstall a service definition.
- You must include the .mac extension.
- During installation, Service Manager precompiles the service definition and extracts the definition file's timestamp.
- After you install the service definition, you can use the definition to create service sessions for subscribers.
- To update an existing service definition, you make changes to the original macro file on your computer, copy the updated file to NVS, and install the updated file. All subsequent service sessions use the new service definition file. However, currently active service sessions continue to use the original definition file until the sessions are deactivated, then reactivated.
- Example 1—Installing

  host1(config)#**service-management install tiered.mac**

- Example 2—Uninstalling

  host1(config)#**no service-management install tiered.mac**

- Example 3—Updating

  ! update the original macro file on the remote system

  ! copy the updated macro file to the router
  host1#**copy boston:/serviceDefs/triplePlay/tiered.mac tiered.mac**
  host1#**configure terminal**
  ! install the updated service definition on the router
  host1(config)#**service-management install tiered.mac**

- Use the **no** version to uninstall a service definition.

Referencing Policies in Service Definitions

In Profile Configuration mode, policy interface commands for IP and L2TP allow attachments to be merged into any existing merge-capable attachment at an attachment point. Merged policies are dynamically created. Service Manager can request that multiple interface profiles be applied or removed at an interface as part of service activation or deactivation. Service Manager also specifies whether or not the attachments created from these interface profiles persist on subsequent reloads.

Service Manager can specify whether a component policy attachment is non-volatile. If the interface where the component policy is attached is volatile, then policy management makes the attachment volatile even when the Service Manager specifies otherwise. A non-volatile interface can have both volatile and non-volatile component policy attachments. The merged policy that is created is the merge of all component policies attached at a given attachment point regardless of their volatility. The merged policy and its attachments are always volatile and reconstructed on each reload operation.

For further details on merging policies, see *JUNOSe Policy Management Configuration Guide, Chapter 6, Merging Policies*.

Referencing QoS Configurations in Service Definitions

You can use QoS profiles and QoS parameters to define a service for a subscriber. For example, you can configure the shaping rate for traffic in a video service by using a QoS parameter instance.

To transmit the QoS configuration to the subscriber interface (that is, the forwarding interface at the top of the interface column), you must configure the QoS profiles and QoS parameter instances in static profiles.

Specifying QoS Profiles in a Service Definition

You can configure one QoS profile per subscriber interface. We recommend that you specify the QoS profile in the first set of services applied to the subscriber's interface.

You can modify the QoS profile by modifying configurations referenced by the QoS profile, including QoS parameter instances. You can also attach a new QoS profile when activating a service, but make sure that the QoS profile is attached to the subscriber's interface.

For more information about configuring QoS profiles, see *JUNOSe Quality of Service Configuration Guide, Chapter 16, Configuring and Attaching QoS Profiles to an Interface*.

Configuring a QoS Profile for Service Manager

To configure a QoS profile for Service Manager:

1. Configure the profile.

   host1(config)#**profile videoService**

2. Configure the QoS profile.

   host1(config-profile)#**qos-profile videoBandwidth1**

3. (Optional) Complete the QoS profile configuration described in *JUNOSe Quality of Service Configuration Guide, Chapter 16, Configuring and Attaching QoS Profiles to an Interface*.

profile

- Use to create a profile and enter Profile Configuration mode.
- You specify a profile name with up to 80 alphanumeric characters.
- Example

  host1(config)#**profile iptv**
  host1(config-profile)#

- Use the **no** version to remove a profile.

qos-profile

- Use to add a QoS profile command for use with Service Manager. When the service is activated, the QoS profile is created and attached to the subscriber interface.
- Example

  host1(config)#**profile iptv**
  host1(config-profile)#**qos-profile video**

- Use the **no** version to remove the QoS profile from the profile.

Specifying QoS Profiles in a Service Definition

After you configure a QoS profile for Service Manager, you can reference it in a service definition. For example:

```
profile <# eastcoast ; '\n' #>
   qos-profile <# video; '\n' #>
```

In this example, activating the service definition attaches the video QoS profile to the subscriber interface. Service Manager overwrites the existing QoS profile attachment at the subscriber interface.

Deactivating the service detaches the video QoS profile from the subscriber interface.

Specifying QoS Parameter Instances in a Service Definition

You can specify that Service Manager create QoS parameter instances when the subscriber logs in (during service activation) or through RADIUS QoS parameter VSAs.

You can specify up to eight parameter instance commands within a profile. When you activate a service, Service Manager creates or modifies parameter instances for the subscriber interface that matches one of the subscriber-interface types configured in the QoS parameter definition.

Deactivating a service can modify or remove QoS parameter instances.

Using a service definition, you can also configure QoS parameters instances to add value to an existing parameter instance using the **add** keyword or dynamically create new parameter instances with an initial value using the **initial-value** keyword.

For more information about configuring QoS parameters, see *JUNOSe Quality of Service Configuration Guide, Chapter 23, QoS Parameter Overview*.

Creating a Parameter Instance in a Profile

To create a QoS parameter instance for Service Manager:

1. Configure the QoS parameter definition described in *JUNOSe Quality of Service Configuration Guide, Chapter 23, QoS Parameter Overview*.

   You must configure at least one controlled-interface type and one subscriber-interface type. The range specified in the parameter definition controls the available value of the parameter instance.

2. Configure the QoS profile.

   host1(config)#**profile video**

3. Configure the QoS parameter instance command in the profile.

   host1(config-profile)#**qos-parameter videoBandwidth1 add 40000**

qos-parameter

- Use to create a parameter instance command in a profile. When the service is activated, the parameter instances are created for the subscriber interface.
- Use the **add** keyword in Profile Configuration mode to add a value to an existing parameter instance.
- Use the **initial-value** keyword to create a new instance with the specified value.
- Examples

  host1(config)#**profile video**
  host1(config-profile)#**qos-parameter max-subscriber-bandwidth initial-value 15000**

- In Profile Configuration mode, the **no** version removes the QoS parameter instance command in the profile.

Specifying QoS Parameter Instances in a Service Definition

After you configure a QoS parameter instance for Service Manager, you can reference it in a service definition. For example:

```
<# qosserviceone(bandwidth1, bandwidth2) #>
     profile <# profileName ; '\n' #>
        qos-parameter <# qosParameterName1 ; ' ' ; bandwidth1 ; '\n' #>
        qos-parameter <# qosParameterName2 ; ' ' ; bandwidth2 ; '\n' #>
<# endtmpl #>
```

When you activate a service, Service Manager creates the parameter instance and overwrites previous parameter instances. For example, activating the qosserviceone service definition creates a profile containing two QoS parameter instances. Service Manager creates the qosParameterName1 parameter instance with the value of bandwidth1, and creates qosParameterName2 with a value of bandwidth2.

If you activate the service definition using qosserviceone(2000000,3000000), Service Manager creates qosParameterName1 with a value of 2000000 and qosParameterName2 instance with a value of 3000000.

Specifying the Add and Initial-Value Keywords

You can use the **add** keyword to add value to an existing parameter instance. For example:

```
<# qosserviceone(bandwidth1, bandwidth2) #>
    profile <# profileName ; '\n' #>
        qos-parameter <# qosParameterName3 ; ' add ' ; bandwidth2 ; '\n' #>

<# endtmpl #>
```

When you specify parameter instances using the **add** keyword, you can also use the **initial-value** keyword to specify an initial value. For example:

```
<# qosserviceone(bandwidth1, bandwidth2) #>
    profile <# profileName ; '\n' #>
        qos-parameter <# qosParameterName4 ; ' add ' ; bandwidth2 ;
                                    ' initial-value 1000000' ; '\n' #>
<# endtmpl #>
```

When you activate the service, Service Manager locates the existing QoS parameter instance in the interface column. If Service Manager does not find a parameter instance, it creates one with a value specified in the **initial-value** keyword (in this case, 100000). The value in the command is then added to the initial value. If an existing parameter instance is found, Service Manager adds the value to the existing interface.

For example, when you activate qosServiceOne as qosServiceOne(2000000,3000000), Service Manager attempts to locate the parameter instance qosParameterName4 for the subscriber's interface. If it finds a parameter instance, it adds bandwidth2 (3,000,000) to the current value. If Service Manager does not find a parameter instance, it creates one with an initial value of 1,000,000 and adds 3,000,000. The final parameter instance value is 4,000,000.

When deactivating the service, Service Manager locates the QoS parameter instance and subtracts the value in the command from the existing instance value. If the parameter is no longer referenced, the parameter instance is removed.

Modifying QoS Configurations with Service Manager

This section describes how to modify QoS configurations with Service Manager.

Modifying Parameter Instances

Service Manager activates services without considering current parameter instance values. For example, when you deactivate a video service, Service Manager can add 5 Mbps to a parameter associated with the shaping rate of a video queue.

Similarly, Service Manager can deactivate services and restore parameter instances to their previous value. For example, when you deactivate a video service, Service Manager can subtract 5 Mbps from a parameter associated with the shaping rate of a video queue.

Table 132 lists the results of a series of activations and deactivations of parameters using the **add** and **initial-value** keywords.

Table 132: Sample Modifications Using the Add and Initial-Value Keywords

Action	QoS Parameter Instance	Result
Activate	qos-parameter video-bw add 5000000 initial-value 0	Parameter instance video-bw is created with a value of 5000000
Activate	qos-parameter video-bw add 1000000 initial-value 0	Parameter instance video-bw is increased by 1000000, for a total of 6000000
Deactivate	qos-parameter video-bw add 1000000 initial-value 0	Parameter instance video-bw is decreased by 1000000, for a total of 500000
Deactivate	qos-parameter video-bw add 5000000 initial-value 0	Parameter instance video-bw is removed

Removing a parameter instance using profiles is based on the number of times a parameter instance is modified, not the value added.

Modifying parameter instances in profiles and modifying explicit parameter instances can cause invalid parameter instance values. Table 133 lists a series of activations and deactivations using parameter instances in profiles and explicit parameter instances. By the second deactivation, the parameter has a negative value (-4000000).

NOTE: We recommend that you do not configure negative values for Service Manager.

Table 133: Sample Modifications Using Parameter Instances

Action	QoS Parameter Instance	Result
Activate	qos-parameter video-bw add 5000000 initial-value 0	Parameter instance video-bw is created with a value of 5000000
Activate	qos-parameter video-bw add 1000000 initial-value 0	1000000 is added to parameter instance video-bw, for a total of 6000000
Activate	qos-parameter video-bw 2000000	Parameter instance video-bw is set to 2000000
Deactivate	qos-parameter video-bw add 1000000 initial-value 0	1000000 is subtracted from parameter instance video-bw for a total of 1000000
Deactivate	qos-parameter video-bw add 5000000 initial-value 0	5000000 is subtracted from parameter instance video-bw for a total of -4000000
Deactivate	qos-parameter video-bw 2000000	Parameter instance video-bw is removed

Modifying QoS Configurations in a Single Service Manager Event

QoS accepts QoS profile attachments and parameter instances created using multiple sources (profiles, RADIUS, or Service Manager) within a single Service Manager event. Events include:

- Subscriber login
- Subscriber logout
- RADIUS Change of Authority (CoA)

QoS prioritizes the creation of QoS profiles and parameter instances within events. Table 134 lists the sources that overwrite QoS profiles and parameter instances created by other sources. Each row represents new QoS profiles and parameter instances; columns represent existing QoS profiles and parameter instances.

Table 134: Configuration Within a Single Service Manager Event

	Profile	RADIUS	Service Manager
Profile	✔	–	–
RADIUS	✔	✔	–
Service Manager	✔	✔	✔

Modifying QoS Configurations Using Other Sources

You can modify QoS configurations with Service Manager by using other QoS sources. For example, you can modify a parameter instance that was created with Service Manager by using the CLI. Similarly, you can use SNMP to detach a QoS profile attached by Service Manager.

Table 135 lists the sources that you can use to modify QoS profile attachments and parameter instances.

Table 135: Modifying QoS Configurations with Other Sources

	QoS Profile Attachment	QoS Parameter Instances
Service Manager	✔	✔
RADIUS	✔	✔
SNMP	✔	–
SRC software	✔	–
CLI	✔	✔

The following sections describe the precedence of each source when modifying configurations.

Service Manager

QoS profile attachments and parameter instances created through Service Manager have precedence over all other sources. For example, Service Manager can overwrite a QoS profile attachment modified through RADIUS, SNMP, the SRC software, or the CLI.

Conversely, Service Manager configurations can be overwritten through SNMP, the SRC software, and the CLI, but not by RADIUS.

Service Manager counts references of parameter instances. You can modify parameter instances created by Service Manager using other sources without affecting the reference counts. For more information, see *QoS Statistics* on page 564.

RADIUS

QoS profile attachments and parameter instances configured through RADIUS can overwrite QoS profile attachments and parameter instances configured through the SNMP, the SRC software, and the CLI, but not those created by Service Manager.

Conversely, QoS profiles and parameter instances configured through RADIUS can be overwritten by any source (SNMP, the SRC software, CLI, and Service Manager).

SNMP, the SRC Software, and the CLI

QoS profile attachments and parameter instances configured through the CLI can overwrite QoS profile attachments and parameter instances configured through any source.

QoS profiles attached through SNMP and the SRC software can also overwrite QoS profile attachments configured through any source.

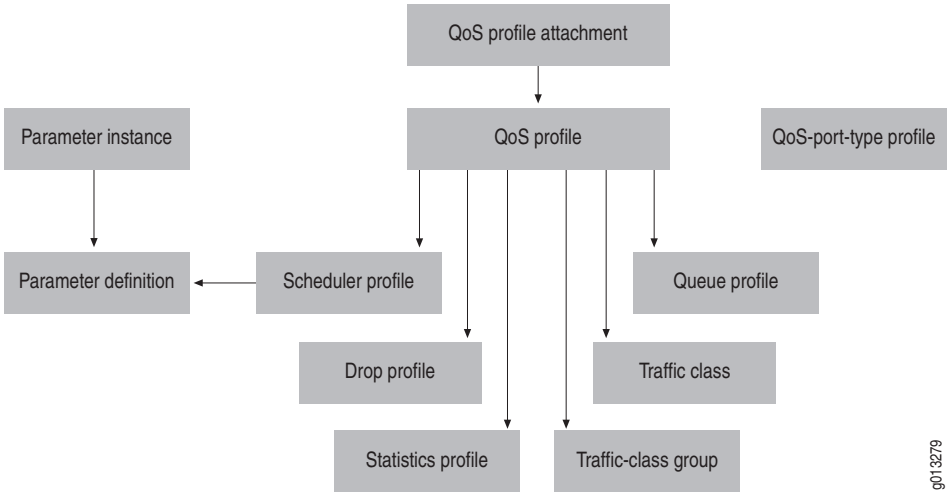
Conversely, QoS profiles and parameter instances configured through the CLI, SNMP, or the SRC software can be overwritten by any source.

Removing QoS Configurations Referenced by Service Manager

When Service Manager no longer references a QoS configuration, it must be removed from the service definition.

Figure 28 on page 563 shows the references for QoS configurations.

Figure 28: QoS Configuration Dependency Chain



Service Manager automatically removes QoS profiles and parameter instances. After removing the QoS profile and parameter instances, Service Manager automatically removes the following QoS configurations in the following order:

1. QoS profiles
2. Scheduler profiles
3. Queue profiles
4. Drop profiles
5. Statistics profiles

Service Manager does not automatically remove the following QoS configurations:

- Parameter definitions
- Traffic classes
- Traffic-class groups
- QoS-port-type profiles

QoS for Service Manager Considerations

When you specify QoS configurations in Service Manager, the following considerations apply.

RADIUS or Service Manager

We recommend that you choose either RADIUS or Service Manager to create a single parameter instance. If you use both RADIUS and Service Manager, parameter instances activated using Service Manager take precedence.

Interoperability with Other Service Components

Service Manager removes QoS profiles and parameter instances if other components in the service definition (for example, policies) cause an error.

QoS Statistics

Service Manager counts references of parameter instances in profiles. The reference count is incremented each time the parameter is configured through the CLI, RADIUS, or Service Manager. The reference count is decremented each time the parameter is unconfigured, such as through service deactivation. Modifications to parameter instances are also reference counted, using a separate reference count. Parameter instances are removed when both reference counts reach zero.

Service Manager also counts references of modified parameters in profiles using the **add** keyword. The reference count is incremented each time the parameter is modified though service activation with the **add** keyword. The reference count is decremented each time the parameter is modified through service deactivation. References of regular parameter instances are also counted, using a separate reference count. Parameter instances are removed when both reference counts reach zero.

Ranges

You can verify ranges for parameter instances by specifying a range in the parameter definition using the **range** command.

When activating the service or modifying parameters, Service Manager verifies the value of the parameter instance to be within the specified range and generates an informational log message indicating the value is outside the range. Service Manager does not verify ranges when you specify the parameter instances within profiles at the time of configuration.

Configuring the Service Manager License

Use the Service Manager license to enable full Service Manager application support. You can create a maximum of 10 subscriber sessions when the Service Manager license is not enabled. If you disable the Service Manager license and more than 10 subscriber sessions exist, you cannot enable any new sessions—however, all existing active subscriber sessions continue to function.

For information about the maximum number of subscriber sessions supported, see *JUNOSe Release Notes, Appendix A, System Maximums*.

license service-management

- Use to specify the Service Manager license and enable full Service Manager application support—if the license is not enabled, you are limited to 10 subscriber sessions.
- The license is a unique string of up to 15 alphanumeric characters.

NOTE: Obtain the license from Juniper Networks Customer Service or your Juniper Networks sales representative.

- Example

  host1(config)#**license service-management 123456789**

- Use the **no** version to disable the license.

Managing and Activating Service Sessions

You can use either RADIUS or the CLI to manage, activate, and deactivate service sessions. The following list describes some of the differences between using RADIUS and the CLI to manage the Service Manager application.

- RADIUS-based login and RADIUS CoA support:
  - Provides dynamic activation and deactivation based on subscriber service selection
  - Provides greater flexibility and efficient management for a large number of subscribers and services
  - Enables you to use mutual exclusion (mutex) groups to create mutex services (RADIUS CoA only)
- CLI-based support:
  - Provides static activation and deactivation for subscribers who are always logged in
  - Is useful for testing new service definitions
  - Enables you to preprovision services that you can activate later

Using RADIUS to Manage Subscriber Service Sessions

Service Manager supports two RADIUS-based methods for dynamically activating subscriber service sessions. Dynamic service sessions that RADIUS activates are not stored in NVS. Both methods can also apply optional statistics and session threshold (volume and time) configurations. The two methods differ in how Service Manager activates a subscriber service session:

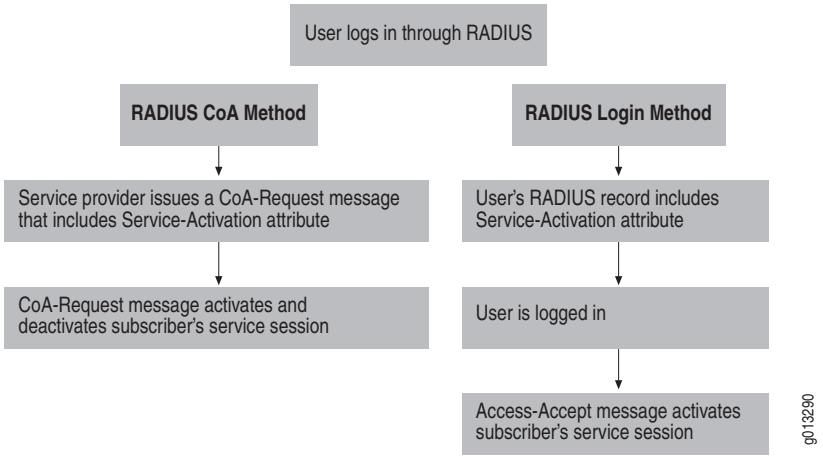
- RADIUS login method—The service session is activated when the subscriber logs in. At login, RADIUS verifies that the Activate-Service attribute is configured in the subscriber's RADIUS record. RADIUS then uses vendor-specific attributes (VSAs) in the Access-Accept packet to activate the service session for the subscriber. This method is useful when your subscribers are not currently logged in.
- RADIUS CoA method—Supports dynamic service selection for subscribers. For example, the subscriber might have logged in without a service, or might have used the RADIUS login method to activate a service at login. If no service was activated at login (because of no Activate-Service attribute in the user's RADIUS record), you can later use the CoA method and a separate RADIUS record to create a subscriber session and activate a service session for the subscriber. Or, if the RADIUS login method was used and the subscriber already has an active

service session, you can use the CoA method and a new RADIUS record to activate a new service session for the subscriber (and optionally deactivate the existing service session). The RADIUS CoA method is useful when you have a large number of users already logged in through RADIUS and you want to activate new services for them. This method is also used for the guided entrance service described in *Guided Entrance Service Definition Example* on page 593.

The RADIUS CoA method also supports the use of mutex groups to create mutex services. See *Using Mutex Groups to Activate and Deactivate Subscriber Services* on page 571.

Figure 29 compares the two RADIUS-based methods.

Figure 29: Comparing RADIUS Login and RADIUS CoA Methods



Using RADIUS to Activate Subscriber Service Sessions

To use RADIUS to activate subscriber service sessions, you create a RADIUS record that includes the Activate-Service VSA. For the RADIUS login method, this RADIUS record is used by the Access-Accept message to start Service Manager and activate the service when the subscriber logs in.

For the RADIUS CoA method, the service provider uses a CoA-Request message to activate and deactivate the service for the subscriber who is already logged in.

To configure a service session that will be activated by RADIUS:

1. Create the RADIUS record for the subscriber and service:

   - For RADIUS login—Create the RADIUS record for the subscriber and include the Activate-Service VSA in the record. Specify values for the parameters defined in the service template name of the definition macro file.

- For RADIUS CoA—Format the CoA message to create the RADIUS record for the subscriber. Include the Activate-Service VSA in the record. Optionally, include the Deactivate-Service VSA if the subscriber has an active service session that you want to deactivate. Specify values for the parameters defined in the service template name of the definition macro file.

NOTE: You specify the parameter values in the order in which the parameters appear in the template name of the service definition file. For example, in the tiered service that is defined in Figure 27 on page 553, the template name is:

```
<# tiered(inputBW, outputBW) #>
```

For the RADIUS Activate-Service VSA, you specify values for the input and output bandwidth:

```
tiered(1280000, 5120000)
```

2. Specify optional VSAs for the service session as needed:
   - Service-Volume
   - Service-Timeout
   - Service-Statistics

Service Manager RADIUS Attributes

For the RADIUS login method, the RADIUS VSAs for service activation, threshold configuration, statistics configuration, and interim accounting in Access-Accept messages at subscriber login are used by Service Manager to activate the appropriate service session. For the RADIUS CoA method, Service Manager uses the VSAs for service activation and deactivation, threshold configuration, statistics configuration, and interim accounting in CoA-Request messages to activate the service session. The accounting-related VSAs are included in RADIUS accounting messages.

Table 136 lists the Service Manager-related attributes and indicates which are tagged VSAs. See *Using Tags with RADIUS Attributes* on page 569 for a discussion about using tagged VSAs to group attributes for a service.

Table 136: Service Manager RADIUS Attributes

Attribute Number	Attribute Name	RADIUS Message Type	VSA Description
[1]	User-Name (used with Virtual-Router, Juniper Networks VSA 26-1)	Access-Accept	Uniquely identifies the subscriber session
[8]	Framed-IP-Address (used with Virtual-Router, Juniper Networks VSA 26-1)	Access-Accept	Uniquely identifies the subscriber session

Table 136: Service Manager RADIUS Attributes (continued)

Attribute Number	Attribute Name	RADIUS Message Type	VSA Description
[26-65]	Activate-Service	Access-Accept and CoA-Request	Name of the service to be activated; includes parameter values; a tagged VSA
[26-66]	Deactivate-Service	Access-Accept and CoA-Request	Name of the service to be deactivated **Note:** This VSA is only used by CoA.
[26-67]	Service-Volume	Access-Accept and CoA-Request	Number of MB of traffic that the service can consume; the service is terminated when output byte count exceeds this value; a tagged VSA
[26-68]	Service-Timeout	Access-Accept and CoA-Request	Number of seconds that the service is to remain active; the service is terminated when the time expires; a tagged VSA
[26-69]	Service-Statistics	Access-Accept and CoA-Request	Statistics configuration; a tagged VSA: 0 = disable 1 = timestamp only 2 = timestamp and volume
[26-83]	Service-Session	For service sessions only: Acct-Start Acct-Stop Interim-Acct	Name of the service (including parameter values) with which the statistics are associated
[26-140]	Service-Interim-Acct-Interval	Access-Accept and CoA-Request	Number of seconds between accounting updates for a service; a tagged VSA
[31]	Calling-Station-ID	Access-Accept	Uniquely identifies the subscriber session
[44]	Acct-Session-ID	Acct-Start Acct-Stop Interim-Acct	Accounting identifier that makes it easy to match start and stop records in a log file; the format is extended to include a colon-separated value that uniquely identifies the subscriber session

NOTE: Service Manager statistics collection is a two-part procedure. You must configure statistics information in the service definition macro file and also enable statistics collection in the RADIUS record.

The Service-Volume and Service-Timeout VSAs rely on the values captured by the Service Manager statistics feature to determine when a threshold is exceeded. Therefore, you must configure and enable statistics collection to use these attributes. Service-Volume For detailed information about Service Manager statistics see *Configuring Service Manager Statistics* on page 586.

Table 137 describes a partial RADIUS Access-Accept packet that activates a service session for subscriber client1@isp1.com. (Figure 27 on page 553 shows the service definition macro file that creates the tiered service.) The session enables the subscriber to use the tiered service with an input bandwidth of 1280000 and output bandwidth of 5120000. The subscriber can use the service for 5 hours (18000 seconds), and Service Manager captures both timestamp and volume statistics during the session (service-statistics value of 2). Also, accounting for the service is updated every 600 seconds (10 minutes).

Table 137: Sample RADIUS Access-Accept Packet

RADIUS Attribute	Tag	Value
username	none	client1@isp1.com
class	none	(binary data)
service-activation	6	tiered(1280000, 5120000)
service-timeout	6	18000
service-statistics	6	2
service-interim-acct-interval	6	600

Using Tags with RADIUS Attributes

Service Manager uses tagged RADIUS VSAs to enable a single RADIUS record to activate multiple service sessions for a subscriber, with each session having unique attributes. A particular tag identifies a specific Activate-Service attribute and all other RADIUS attributes that are associated with that Activate-Service attribute.

You can specify a maximum of 8 tags (1–8), which enables you to activate up to eight unique service sessions for a subscriber in a single RADIUS record. The following are tagged VSAs—they must always have a tag in their RADIUS entry:

- Activate-Service
- Service-Statistics
- Service-Timeout
- Service-Volume
- Service-Interim-Acct-Interval

Table 138 describes an Access-Accept packet that activates the two services, tiered and voice, for subscriber client1@isp1.com. Each service has its own unique tag, enabling you to assign attributes for one service, but not the other. For example, the two services have different timeout settings and different interim accounting intervals, and statistics are enabled only for the tiered service.

Table 138: Using Tags

RADIUS Attribute	Tag	Value
username	none	client1@isp1.com
class	none	(binary data)
service-activation	2	tiered(1280000, 5120000)
service-timeout	2	18000
service-statistics	2	1
service-interim-acct-interval	2	600
service-activation	6	voice(100000)
service-timeout	6	1440
service-interim-acct-interval	6	1200

Using RADIUS to Deactivate Service Sessions

A service session can be deactivated by a CoA-Request message or when a subscriber logs out of a RADIUS-activated service session. If the subscriber logs off the router, Service Manager deactivates that subscriber session and all associated service sessions.

RADIUS also supports attributes that you can use to manage deactivation of service sessions. You can:

- Set time or volume thresholds for the service
- Use the Deactivate-Service RADIUS attribute

Setting Thresholds

You can set a threshold for the session by including one or both of the following attributes in the RADIUS record:

NOTE: The Service-Timeout and Service-Volume attributes use values captured by the Service Manager statistics feature to determine when a threshold is exceeded. Therefore, you must configure and enable statistics collection to use these attributes. See *Configuring Service Manager Statistics* on page 586.

- Service-Timeout—The number of seconds that the service session is active. You can specify a number in the range 0–16777251. A value of 0 indicates that the session never times out. A particular Service-Timeout VSA can be used by a maximum of 2000 services.

  The service-timeout threshold accuracy is within 30 seconds of the specified value.

- Service-Volume—The total number of MB of traffic that can use the service session. You can specify a number in the range 0–16777251 MB. A value of 0 indicates that there is no limit to the amount of traffic for the session. A particular Service-Volume VSA can be used by a maximum of 1000 services.

Service Manager terminates a session when the *output* byte count exceeds the configured service-volume threshold. The output byte count is captured by the **output-stat-clacl** string in the classifier list variable that you configure to collect statistics. See *Configuring Service Manager Statistics* on page 586.

The service-volume threshold accuracy is based on a 10-second period. Service Manager does not immediately deactivate a service session when the output byte count reaches the service-volume threshold. Instead, Service Manager checks the volume in 10-second intervals and deactivates a service session at the end of the 10-second period in which the output byte count reaches the volume threshold. For example, if a threshold is reached 4seconds into the 10-second interval, the session continues for the remaining 6 seconds in the measuring period and is then terminated. Therefore, the total volume equals the threshold plus the volume during the additional 6 seconds.

When the output byte count reaches the threshold, RADIUS deactivates the service session. You must use tags to associate threshold attributes with the Activate-Service attribute for the service session.

Using the Deactivate-Service Attribute

You can also include the Deactivate-Service attribute in the subscriber's RADIUS record. The format for this attribute is the same as the format of the Activate-Service attribute—the name of the service, including parameters. The Deactivate-Service attribute is used by RADIUS CoA messages, such as in a guided entrance service. See *Guided Entrance Service Example* on page 592 for more information.

Using Mutex Groups to Activate and Deactivate Subscriber Services

Service Manager supports two methods that use RADIUS CoA-Request messages to activate and deactivate subscriber services and that can also dynamically change a service that is currently provided to a subscriber.

In the first method, you use a CoA message with the Activate-Service VSA to activate the new service; you can optionally include the Deactivate-Service VSA to deactivate the subscriber's existing service. This method is described in *Using RADIUS to Activate Subscriber Service Sessions* on page 566.

The second method uses mutual exclusion (mutex) groups to create mutex services. With this method, you group services together in a mutex group. When you use a CoA message to activate a service that is in a mutex group, Service Manager activates the new service and implicitly deactivates any existing service that it is a member of the same mutex group as the newly activated service. Service Manager does not deactivate an existing service that is a member of a different mutex group or is not a member of a mutex group.

Using mutex services results in an more reliable activation and deactivation process than the original CoA-Request method. With mutex services, Service Manager always activates the new service before deactivating the existing service. This ensures that the subscriber is never without an active service. In the original CoA-Request method, the order of activation and deactivation is random—in some cases the existing service might be deactivated before the new service is activated, or the new activation might fail. In these cases, the subscriber might be without an active service.

If statistics are enabled when you activate a mutex service, Service Manager sends a RADIUS Acct-Stop message for the deactivated service.

Activating and Deactivating Multiple Services

The Service Manager mutex service feature enables you to activate and deactivate multiple services with a single CoA-Request message. A CoA-Request message can have more than one service activation request—the multiple service requests might be from the same mutex group or from different groups. The following examples describe how you might use mutex groups to activate and deactivate multiple services.

- Example 1—Multiple mutex services of the same mutex group

  Service Manager activates the multiple mutex services, which are in the same group, then deactivates all previously existing services that are also members of that mutex group. Active services that are members of different mutex groups are unaffected.

- Example 2—Multiple mutex services of different mutex groups

  Service Manager activates the mutex services, which are members of different mutex groups. Service Manager then deactivates all previously existing services that are members of the same mutex groups as any of the newly activated services. Active services that are members of different mutex groups are unaffected.

Configuring a Mutex Service

To configure and enable a mutex service, you complete the following steps:

1. Create the new service definition and configure the service as a member of a mutex group.

   When you create the service definition, include the following service attribute in the service definition, where groupIndex identifies the mutex group for this service. The groupIndex can be a number in the range -1 to - 2147483648 or 1 to 2147483648. If the groupIndex is outside of the acceptable ranges, or if you do not include the mutex-group statement, the service is not included in a mutex group.

   <# env.setResult("mutex-group", *“groupIndex”*) #>

For example (the mutex group attribute is highlighted in bold text):

```
!parameterizes input and output bandwidth
<# tiered(inputBW, outputBW) #>

<# uid := app.servicemanager.getUniqueId #>
<# name := "SM-tiered-" $ uid #>
<# oname := "SM-O-tiered-" $ uid #>


classifier-list matchAll ip any any
rate-limit-profile <# name #> one-rate
    committed-rate <# inputBW; '\n' #>

policy-list <# name; '\n' #>
    classifier-group matchAll precedence 10000
        rate-limit-profile <# name; '\n' #>
        traffic-class best-effort

policy-list <# oname; '\n' #>
    classifier-group matchAll precedence 10000
        traffic-class best-effort

profile <# name; '\n' #>
    ip policy secondary-input <# name #> statistics enabled merge
    ip policy output <# oname #> statistics enabled merge
    qos-profile triplePlayIP
    qos-parameter maxSubscBW <# outputBW; '\n' #>

<# env.setResult("mutex-group", “12”) #>
<# env.setResult("activate-profile", name) #>
<# env.setResult("secondary-input-stat-clacl", "matchAll") #>
<# env.setResult("output-stat-clacl", "matchAll") #>

<# endtmpl #>
```

2. Activate the mutex service

   Use a RADIUS CoA-Request message and the new service definition to create the mutex service. The new service is considered a mutex service because it belongs to a mutex group.

   Service Manager activates the new service and deactivates any existing active service that is a member of the same mutex group as the new service.

3. (Optional) Verify the status of the new service.

```
host1#show service-management subscriber-session client1@isp.com interface ip
192.168.0.1
User Name: CLIENT1@ISP.COM, Interface: ip 192.168.0.1
 Id: 1
 Owner: AAA 4194326
 Non-volatile: False
 State: Active
 ServiceSessions:
         Name             mutex   Owner/Id      State                Operation
----------------------   -----   -----------   ------------------   ---------
tiered(2000000,3000000)      12   AAA 4194326   ConfigApplySuccess   Activate
         Name             Non-volatile
----------------------   ------------
tiered(2000000,3000000)   False
```

Configuring RADIUS Accounting for Service Manager

The Service Manager application supports RADIUS accounting and interim accounting for subscriber service sessions that are activated by the RADIUS login and RADIUS CoA methods. When RADIUS accounting is enabled, RADIUS generates:

- An Acct-Start message when a service session is activated
- An Acct-Stop message when a service session is deactivated
- Interim-Acct messages

RADIUS accounting messages always include Service Manager time statistics. You must enable Service Manager volume statistics for a service session.

When you terminate a subscriber session, Service Manager first sends RADIUS Acct-Stop messages for any active services associated with the subscriber session, and then sends the Acct-Stop message for the subscriber session.

NOTE: Service Manager statistics collection is a two-part procedure. You must configure statistics information in the service definition macro file and also enable statistics collection. For detailed information about Service Manager statistics, see *Configuring Service Manager Statistics* on page 586.

To support RADIUS accounting for Service Manager, the RADIUS Acct-Session-ID attribute [44] has been extended to include a colon-separated identifier, which uniquely identifies a service for a subscriber. For example:

```
erx FastEthernet 12/0:0001048580:002478
```

The Service-Session attribute (VSA 26-83) identifies the name of the service. This attribute is the value of the Activate-Service or Deactivate-Service attribute (including parameter values) that was used in the RADIUS Access-Accept message to activate or deactivate the service session. For example:

```
tiered(1280000, 5120000)
```

Table 139 lists the RADIUS accounting attributes used by the Service Manager application.

Table 139: Service Manager RADIUS Accounting Attributes

Attribute Number	Attribute Name	RADIUS Message Type	VSA Description
[26-83]	Service-Session	For service sessions only: Acct-Start Acct-Stop Interim-Acct	Name of the service (including parameter values) with which the statistics are associated
[26-140]	Service-Interim-Acct-Interval	Access-Accept and CoA-Request	Number of seconds between accounting updates for a service; a tagged VSA
[44]	Acct-Session-ID	Acct-Start Acct-Stop Interim-Acct	Accounting identifier that makes it easy to match start and stop records in a log file; the format is extended to include a colon-separated value that uniquely identifies the subscriber session

Configuring Service Interim Accounting

Interim accounting determines how often accounting information is updated and sent to an accounting server. In addition to the user-based interim accounting supported on the router, Service Manager supports service-related interim accounting—you can configure an interim accounting interval for services that are created during a user RADIUS-based login and services that are activated by a CoA operation.

The service interim accounting interval is specified by the RADIUS Service-Interim-Acct-Interval attribute (VSA 26-140) that is included in the RADIUS Access-Accept message or CoA-Request message that activates a service session. Because the Service-Interim-Acct-Interval attribute is a tagged attribute, you can configure different interim accounting intervals for a particular user's various services.

You can use the **aaa service accounting interval** command to specify the default service interim accounting interval. Service Manager uses this interval value for service accounting when the Service-Interim-Acct-Interval attribute is not configured.

NOTE: You can also configure interim accounting for users. A user interim accounting interval is configured in the Acct-Interim-Interval RADIUS attribute (RADIUS attribute 85). You use the **aaa user accounting interval** command to specify the default user interim accounting interval, which is used when RADIUS attribute 85 is not configured. See *Chapter 1, Configuring Remote Access* for information about configuring user interim accounting.

When the Service-Interim-Acct-Interval attribute is configured for a service, Service Manager uses the guidelines shown in Table 140 to determine the correct interim accounting interval to use for the service.

Table 140: Determining the Service Interim Accounting Interval

Service-Interim-Acct-Interval Value	Service Manager Action
0	Disables interim accounting for the service
1–599	Uses 600
600–86400	Uses the specified value
86401 or greater	Uses 86400
The tag for the service-interim-acct-interval attribute does not match the tag for any service-activate attribute (VSA 26-65)	Discards the service-interim-acct-interval attribute

Table 141 describes a sample Acct-Start message for a service session. In the table, the two fields used by Service Manager are highlighted. An Acct-Start message for a subscriber session without any active services does not include the Service-Session attribute.

Table 141: Sample Acct-Start Message for a Service Session

RADIUS Attribute	Sample Value
acct-status-type	1
username	client1@isp1.com
event-timestamp	1112191723
acct-delay-time	0
nas-identifier	ERX-01-00-06
acct-session-id	**erx FastEthernet 12/0:0001048580:002478**
nas-ip-address	10.6.128.45
class	(binary data)
framed-protocol	0
framed-compression	0
framed-ip-address	100.20.0.1
framed-ip-netmask	0.0.0.0
ingress-policy-name (vsa)	forwardAll
egress-policy-name (vsa)	forwardAll
calling-station-id	#ERX-01-00-06#E12#0
acct-input-gigawords	0
acct-input-octets	4032
acct-output-gigawords	0
acct-output-octets	2163
acct-input-gigapackets (vsa)	0

Table 141: Sample Acct-Start Message for a Service Session (continued)

RADIUS Attribute	Sample Value
acct-input-packets	7
acct-output-gigapackets (vsa)	0
acct-output-packets	7
nas-port-type	15
nas-port	3221225472
nas-port-id	FastEthernet 12/0
acct-authentic	1
acct-session-time	0
acct-service-session	**tiered(1280000, 5120000)**
service-interim-acct-interval	**1200**

aaa service accounting interval

- Use to specify the default interval between service accounting updates. Service manager uses the default interval when no value is specified in the Service-Interim-Acct-Interval attribute (Juniper VSA 26-140).
- This command and the **aaa user accounting interval** command replace the **aaa accounting interval** command, which is deprecated and might be removed in a future release.
- The default interval is applied on a virtual router basis—this setting is used for services associated with all users who attach to the corresponding virtual router.
- Specify the service accounting interval, in the range 10–1440 minutes. The default setting is 0, which disables the feature.

NOTE: To enable interim service accounting, the service accounting interval must be set to a non-zero value and the service statistics type must *not* be set to *none*.

- Example

  host1(config)#**aaa service accounting interval 60**

- Use the **no** version to reset the accounting interval to 0, which turns off interim service accounting when no value is specified in the Service-Interim-Acct-Interval attribute (Juniper VSA 26-140).

aaa user accounting interval

- Use to specify the default interval between user accounting updates. The router uses the default interval when no value is specified in the RADIUS Acct-Interim-Interval attribute (RADIUS attribute 85).
- This command and the **aaa service accounting interval** command replace the **aaa accounting interva**l command, which is deprecated and might be removed in a future release.
- The default interval is applied on a virtual router basis—this setting is used for all users who attach to the corresponding virtual router.

- Specify the user accounting interval, in the range 10–1440 minutes. The default setting is 0, which disables the feature.
- Example

  host1(config)#**aaa user accounting interval 20**

- Use the **no** version to reset the accounting interval to 0, which turns off interim user accounting when no value is specified in the RADIUS Acct-Interim-Interval attribute.

Using the CLI to Manage Subscriber Service Sessions

The CLI-based Service Manager creates static subscriber sessions and service sessions. You can also use CLI commands to immediately deactivate subscriber service sessions. The CLI-based support is particularly useful for:

- Testing your service definitions—for example, you might use the CLI commands to verify that a newly created service definition is correct. When you are satisfied with the service definition, you can then use RADIUS to activate the service for your subscribers.
- Preprovisioning Service Manager services—preprovisioning improves performance and efficiency by freeing Service Manager from having to repeatedly create and remove a service that you activate and deactivate for multiple subscribers. See *Preprovisioning Services* on page 581 for more information about service preprovisioning.

Using the CLI to Activate Subscriber Service Sessions

A subscriber session represents a specific subscriber—the session consists of the subscriber's name, the interface used for the session, and any active services for the subscriber. A subscriber can have one subscriber session active at any given time.

You create a subscriber's service session when you assign a service definition to a subscriber session. Like an AAA-created service, a single subscriber session can have multiple simultaneous service sessions. You can use one method to create the subscriber session, and then a different method to activate the subscriber's service session. For example, you might use RADIUS to create the AAA subscriber session, then use the CLI to activate the service session for the subscriber, You can optionally specify a service session profile that you want to attach to the service session.

You can use the CLI to activate a service session based on subscriber information or owner information:

- Subscriber name and interface method—Activates the service session based on the subscriber name and the interface that the subscriber is using for this subscriber session.

  host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "tiered(1280000, 5120000)"**

- Owner name and ID method—Activates the service session based on the owner that created the subscriber session and the ID that was generated by the owner. For example, if RADIUS is used to create the subscriber session, the owner name is AAA and the owner ID is the Acct-Session-ID that was generated by RADIUS during subscriber creation.

  host1(config)#**service-management owner-session AAA 537446 service-session "tiered(1280000, 5120000)"**

NOTE: You must specify the parameter values in the order in which the parameters appear in the template name of the service definition file. Enclose the service definition name in double quotation marks, with the service's parameter values in parentheses. For example, for the tiered service that is defined in Figure 27 on page 553, the template name is:

<# tiered(inputBW, outputBW) #>

Use the following format with the **service-session** keyword:

"tiered(1280000, 5120000)"

service-management owner-session

- Use to activate a service for an existing subscriber by identifying the owner used to create the subscriber session and specifying the service session to use.
- The subscriber session must exist before you use this command.
- Use this command in Privileged Exec mode to create a dynamic subscriber session—dynamic sessions are deleted after a router reboot.
- Use this command in Global Configuration mode to create persistent subscriber sessions that are retained across reboots.
- Specify the name of the owner (the method originally used to create the subscriber session), and the ID generated by the of the owner. For example, if RADIUS was used to create the subscriber session, the owner name is AAA and the owner ID is the Acct-Session-ID generated by RADIUS when the subscriber session was created.
- Include the optional **service-session-profile** keyword to assign a profile to the service session. The service session profile includes additional attributes, such as the type of statistics to be captured for the service session.
- You can activate one subscriber session for a subscriber—and multiple service sessions for a particular subscriber session. If you create a second subscriber session for the same subscriber, only the newest subscriber session, with its services, is used.
- Example 1—Activate a service session for an existing subscriber

  host1(config)#**service-management owner-session aaa 573498 service-session "video(4500000, 192.168.10.3)"**

- Example 2—Activate multiple service sessions for an existing subscriber

  host1(config)#**service-management owner-session aaa 573498 service-session "video(4500000, 192.168.10.3)"**
  host1(config)#**service-management owner-session aaa 573498 service-session "tiered(1000000, 2000000)"**
  host1(config)#**service-management owner-session aaa 573498 service-session "voice(1000000, 10.10.10.1)"**

- Example 3—Include a service session profile when you activate a subscriber's service session

  host1(config)#**service-management owner-session aaa 426777 service-session "video(4500000, 192.168.10.3)" service-session-profile vodISP1**

- Use the **no** version to deactivate service sessions based on owner information. See *Using the CLI to Deactivate Subscriber Service Sessions* on page 584 for more information about deactivating subscriber service sessions.

service-management subscriber-session service-session

- Use to activate a service for a subscriber by creating a subscriber session and a service session.

NOTE: Always activate at least one service session for a subscriber session. The ability to create a subscriber session without a service session (by omitting the **service-session** keyword) is not currently supported.

- Use this command in Privileged Exec mode to create a dynamic subscriber session—dynamic sessions are deleted after a router reboot.
- Use this command in Global Configuration mode to create persistent subscriber sessions that are retained across reboots.
- Include the optional **service-session-profile** keyword to assign a profile to the service session. The service session profile includes additional attributes, such as the type of statistics to be captured for the service session.
- You can create one subscriber session for a subscriber—and multiple service sessions for a particular subscriber session. If you create a second subscriber session for the same subscriber, only the newest subscriber session, with its services, is used.
- Example 1—Activate a subscriber session with a single service session

  host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "video(4500000, 192.168.10.3)"**

- Example 2—Activate a single subscriber session with multiple service sessions

  host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "video(4500000, 192.168.10.3)"**
  host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "tiered(1000000, 2000000)"**
  host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "voice(1000000, 10.10.10.1)"**

- Example 3—Include a service session profile when you activate a subscriber's service session

  host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "video(4500000, 192.168.10.3)" service-session-profile vodISP1**

- Use the **no** version to deactivate service sessions. See *Using the CLI to Deactivate Subscriber Service Sessions* on page 584 for more information about deactivating subscriber service sessions.

Preprovisioning Services

Preprovisioning service sessions is a technique you can use to improve Service Manager's performance. Typically, when you use a service definition to activate a subscriber's service session, Service Manager uses resources to build that service. However, if you later use the same service definition to activate a service session for a second subscriber, Service Manager does not have to rebuild the service—it bases the new service on the service that it built for the first service session. After you deactivate the first session, Service Manager must build a new service for any subsequent subscribers.

Preprovisioning entails activating a service for a dummy user on the null interface. You can then use the preprovisioned service session to activate service sessions for actual subscribers. This technique improves performance because you only require Service Manager to build the service one time, then reuse the original service when you activate future subscriber service sessions.

To preprovision a service you use a command similar to the following example:

host1(config)#**service-management subscriber-session dummy interface null service-session "tiered(1000000, 2000000)"**

Using Service Session Profiles

Service session profiles provide additional flexibility to the Service Manager application by enabling you to assign one or more supported attributes to a particular activation of a service.

For example, you might assign the same video service to two subscribers, but use different service session profiles to set different time limits for each subscriber's service. One subscriber uses the video service for 5 hours (18000 seconds) while the other subscriber's video service is for 10 hours (36000 seconds). Or, you might enable statistics on a subscriber's voice service and disable statistics on the same subscriber's video service.

You can create multiple service session profiles independent of the service activation process. Then, when you activate a service session, you specify the profile that you want to use with that particular service session—you can apply one profile to a service session.

You can configure the following attributes in service session profiles:

- **statistics**—Enables statistics and specifies the type of statistics you want to capture for the service. See *Configuring Service Manager Statistics* on page 586 for additional information about capturing Service Manager statistics. You can specify the following types of statistics:
  - **time**—The service's duration
  - **volume-time**—The service's duration and traffic volume
- **volume**—Specifies that the service is automatically deactivated when the indicated traffic volume is exceeded.
- **time**—Specifies that the service is automatically deactivated when the indicated time period is exceeded.

NOTE: The **volume** and **time** attributes use values captured by the Service Manager statistics feature to determine when the threshold is exceeded. Service Manager collects time statistics by default—you must configure and enable volume statistics collection. See *Configuring Service Manager Statistics* on page 586.

To create or modify a service session profile:

1. Specify the name of the service session profile; doing this enters Service Session Profile Configuration mode.

   host1(config)#**service-management service-session-profile vodISP1**
   host1(config-service-session-profile)#

2. Specify the attributes you want to include in the profile.

   host1(config-service-session-profile)#**statistics volume-time**
   host1(config-service-session-profile)#**time 6000**

3. (Optional) To modify an existing profile, you can add new attributes or use the **no** version of a command to remove an attribute.

   host1(config-service-session-profile)#**no time**

service-management service-session-profile

- Use to create a new service session profile or to specify the name of an existing profile you want to modify, and to enter Service Session Profile Configuration mode.
- In Service Session Profile Configuration mode, you specify the attributes used in the service session profile, such as the maximum volume limit for the session and the maximum time the session can be used. You can also specify that Service Manager collect statistics for time, or volume, or both.

- Example

  host1(config)#**service-management service-session-profile vodISP1**
  host1(config-service-session-profile)#

- Use the **no** version to delete the service session profile.

statistics

- Use to enable statistics collection and to specify the type of statistics to collect.
  - Use the **time** keyword to collect statistics about the duration of the service session.
  - Use the **volume-time** keyword to collect statistics about both the volume of traffic and the duration of the service session.
- Example

  host1(config)#**service-management service-session-profile vodISP1**
  host1(config-service-session-profile)#**statistics volume-time**

- Use the **no** version to disable statistics collection.

NOTE: Service Manager statistics collection is a two-part procedure. You must configure statistics information in the service definition macro file and also enable statistics collection. See *Configuring Service Manager Statistics* on page 586.

time

- Use to specify the maximum amount of time that the service session can be active for the subscriber.
- The router immediately terminates the subscriber's service session when the specified time is exceeded.
- The range is 0–16777251 seconds.
- Example

  host1(config)#**service-management service-session-profile vodISP1**
  host1(config-service-session-profile)#**time 6000**

- Use the **no** version to delete the time attribute from the service session profile.

volume

- Use to specify the maximum amount of bandwidth that can use the service.
- The router immediately terminates the subscriber's service session when the specified traffic volume is exceeded.

NOTE: The **volume** attribute uses values captured by the Service Manager statistics feature to determine when the threshold is exceeded. Therefore, you must configure and enable statistics collection to use this attribute. See *Configuring Service Manager Statistics* on page 586.

- The range is 0–16777251MB.

- Example

  host1(config)#**service-management service-session-profile vodISP1**
  host1(config-service-session-profile)#**volume 1000000**

- Use the **no** version to delete the volume attribute from the service session profile.

Using the CLI to Deactivate Subscriber Service Sessions

The CLI supports several methods that enable you to manually deactivate service sessions. You can:

- Gracefully terminate all services or a specific service for a particular subscriber
- Gracefully terminate all service or a specific service associated with a particular owner
- Force the immediate termination of all of a subscriber's sessions
- Use service session profiles to create time or volume thresholds for the service and deactivate the service when the threshold is reached. See *Using Service Session Profiles* on page 581.

NOTE: You can use the CLI commands described in this section to delete subscriber and service sessions that are created by either RADIUS or the CLI.

The Service Manager CLI commands enable you to use variations of the **no service-management subscriber-session** command to terminate service sessions.

Gracefully Deactivating Subscriber Service Sessions

Use the following commands to gracefully deactivate subscriber's services—you can deactivate a specific service for a subscriber, or you can delete a subscriber session, which deactivates all of the subscriber's service sessions. We recommend you use this command to deactivate subscriber service sessions.

no service-management owner-session

- Use to gracefully deactivate service sessions for a subscriber based on owner information.
- Specify the owner name and owner ID of the service session you want to deactivate.
- Use the **no** version with the **service-session** keyword to deactivate the specified service session.
- Use the **no** version *without* the **service-session** keyword to delete the subscriber's session and deactivate all of the subscriber's service sessions.
- Example

  host1(config)#**no service-management owner-session aaa 426777 service-session "video(4500000, 192.168.10.3)"**

- This is the **no** version of the **service-management owner-session** command.

no service-management subscriber-session service-session

- Use to gracefully deactivate service sessions for a subscriber.
- Use the subscriber's username and interface, not the subscriber session ID, for graceful deactivation.
- Use the **no** version without the **service-session** keyword to delete the subscriber's session and deactivate all of the subscriber's service sessions.
- Use the **no** version with the **service-session** keyword to deactivate the specified service session.
- Example

  host1(config)#**no service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "tiered(1000000, 2000000)"**

- This is the **no** version of the **service-management subscriber-session** command.

Forcing Immediate Deactivation of Subscriber Service Sessions

Use the following command to force the immediate deactivation of the specified subscriber session—doing this deletes all active service sessions for the subscriber. We recommend this method if you encounter difficulty when you used the graceful deactivation method. Always use the graceful method first.

no service-management subscriber-session force

- Use to force the immediate termination of a subscriber session and to deactivate all services for the specified subscriber session.
- You must specify the subscriber session ID to use the **force** keyword to terminate the subscriber session.

NOTE: To determine the subscriber session ID of a session you want to deactivate, use the **show service-management subscriber-session brief** command. The display lists the IDs of all active subscriber sessions and the owner that created the session, such as AAA (RADIUS) or CLI.

- Example

  host1(config)#**no service-management subscriber-session 8 force**

- There is no affirmative version of this command; there is only a **no** version.

Using Service Session Profiles to Deactivate Service Sessions

To terminate a subscriber service session when a threshold is reached, you create a service session profile that includes a time threshold, or a volume threshold, or both. Then, you attach the service session profile when you activate the service session. When the specified threshold is reached, the service session is terminated.

NOTE: This feature is not supported by the **service-management owner-session** command. The **service-management owner-session** command only supports service session profiles when activating service sessions.

The following example shows the commands you might use to create a time threshold for deactivating a service session. See *Using Service Session Profiles* on page 581 for information about using the **time** and **volume** keywords in service session profiles.

To create or modify a service session profile:

1. Specify the name of the service session profile and configure the threshold:

   host1(config)#**service-management service-session-profile vodISP1**
   host1(config-service-session-profile)#**time 6000**
   host1(config-service-session-profile)#**exit**

2. Include the service session profile when you activate the subscriber service session:

   host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "video(4500000, 192.168.10.3)" service-session-profile vodISP1**

Configuring Service Manager Statistics

The Service Manager application provides a flexible and efficient process for identifying and capturing statistics related to subscriber service sessions. Configuring Service Manager to collect statistics is a two-part process. First, you design the service definition macro file to identify the statistics that you want to collect. Second, you configure Service Manager to enable statistics collection when a service session is activated by either RADIUS or the CLI.

The following section describes how to configure the service definition macro file. For information about configuring Service Manager to enable statistics, see *Enabling Statistics Collection with RADIUS* on page 588 if you are using RADIUS to activate services, or see *Enabling Statistics Collection with the CLI* on page 588 if you are using the CLI.

Setting Up the Service Definition File for Statistics Collection

Service Manager statistics are based on classifier lists—the classifier lists are referenced by policy lists that you define in your service definition macro file.

When you configure your service definition for statistics, you include the macro environment command **env.setResult** to indicate the type of statistics to track and to identify the classifier lists to use when generating statistics. The format of the environment command is:

<# env.setResult("*string*", "*classifier-list-name*") #>

The *string* variable specifies the type of statistics to track—Service Manager supports the following strings:

- **input-stat-clacl**—track input statistics
- **output-stat-clacl**—track output statistics
- **secondary-input-stat-clacl**—track input statistics for a policy attached at the secondary input stage

The *classifier-list-name* variable is the name of the classifier list that is associated with the policy list that is defined in the service definition. You can specify multiple classifier lists in the command.

Example 1 This example is a portion of the service definition macro file in Figure 27 on page 553. The two highlighted commands specify the statistics used by the Service Manager application.

```
profile <# name; '\n' #>
    ip policy secondary-input <# name #> statistics enabled merge
    ip policy output <# oname #> statistics enabled merge
    qos-profile triplePlayIP
    qos-parameter maxSubscBW <# outputBW; '\n' #>

<# env.setResult("activate-profile", name) #>
<# env.setResult("secondary-input-stat-clacl", "matchAll") #>
<# env.setResult("output-stat-clacl", "matchAll") #>

<# endtmpl #>
```

The **< # env.setResult("secondary-input-stat-clacl", "matchAll") # >** command specifies that Service Manager track statistics associated with the classifier list named matchAll, and that this classifier list is associated with the policy that is attached at the secondary input stage.

The **< # env.setResult("output-stat-clacl", "matchAll") # >** command specifies that Service Manager track the output statistics associated with the matchAll classifier list, which is associated with the policy attached at the output stage.

Example 2 This example shows how you can also configure your service definition to collect total statistics from multiple classifier lists. The following command specifies that three classifier lists are used to generate output statistics for a service created by the service definition. Each time statistics are reported for this service, Service Manager uses the total of the statistics for clacl1, clacl2, and clacl3.

```
<# env.setResult("output-stat-clacl", "clacl1 clacl2 clacl3") #>
```

Enabling Statistics Collection with RADIUS

You use the Service-Statistics RADIUS VSA [26-69] with either the RADIUS login or CoA-Request method to enable statistics for RADIUS-activated service sessions. To enable statistics, configure the Service-Statistics VSA with a value of either 1 (timestamp only) or 2 (volume and timestamp).

Table 142 describes a partial RADIUS message in which the Service-Statistics attribute has a value of 2—this enables volume and timestamp statistics for the tiered service assigned to subscriber client1@isp1.com.

Table 142: RADIUS-Enabled Statistics

RADIUS Attribute	Tag	Value
username	none	client1@isp1.com
activate-service	6	tiered(1280000, 5120000)
service-statistics	6	2

When you enable statistics for a RADIUS-activated service, RADIUS accounting reports can use the statistics.

Enabling Statistics Collection with the CLI

You use service session profiles to enable statistics when you activate a service session with the CLI. See *Using Service Session Profiles* on page 581 for detailed information about creating and using service session profiles.

For example, you can use the following procedure to capture statistics that are defined in the service definition macro file for the tiered service:

1. Configure the service session profile to enable statistics. Specify the type of statistics you want to capture (either time or both volume and time).

   host1(config)#**service-management service-session-profile isp1_tiered3**
   host1(config-service-session-profile)#**statistics volume-time**
   host1(config-service-session-profile)#

2. Apply the service session when you activate the subscriber service session.

   host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "tiered(1000000, 2000000)" service-session-profile isp1_tiered3**

The captured statistics are now used when you use the Service Manager **show service-management** commands. For example:

```
host1#show service-management subscriber-session client1@isp1.com interface atm
4/0.1 service-session
User Name: client1@isp1.com, Interface: atm 4/0.1
Service : tiered(1000000,2000000)
 Non-volatile : False
 Owner : CLI
 State : Config ApplySuccess
 Activate : True
 Statistics Type : time-based and volume-based
```

```
Statistics Complete : False
Poll Interval : 0
Poll Expire : 0
Activate Time : THU MAR 01 21:09:12 2006
Time : 0
Time Expire : 0
Volume MBytes: 2
Volume Expire MBytes: 1
Input Bytes : 594
Output Bytes : 1196
Input Packets : 1
Output Packets : 2
```

Service Manager Performance Considerations

Like any application, Service Manager requires a certain amount of system resources. Consider the following guidelines to maximize the performance of Service Manager when delivering subscriber services:

- Minimize service definitions—Use the minimum number of JUNOSe commands in a service definition to specify a service.
- Reference objects in service definitions—Referencing commonly used objects is more resource-efficient than using unique objects for each subscriber (for example, using a subscriber's IP address as a match criteria in a classifier list).
- Preprovision frequently used services— Preprovisioning saves resources by requiring Service Manager to build a popular service only once. You then reuse the original service when you activate future subscriber service sessions. See *Preprovisioning Services* on page 581 for details.
- Capture volume statistics when needed—Repeatedly capturing volume statistics can waste resources.

Service Definition Examples

This section provides examples of service definition macro files. Commented text explains the parameterized values in the examples. Each example is followed by examples of RADIUS information and the CLI command that you might use to activate a subscriber service session.

Tiered Service Example

This example creates a tiered service. A tiered service typically provides set bandwidths for both inbound and outbound traffic for a subscriber. In this example, the bandwidth values are parameterized. Also, this example assumes that QoS profile triplePlayIP and QoS parameter maxSubscBW are configured.

```
!parameterizes input and output bandwidth
<# tiered(inputBW, outputBW) #>

<# uid := app.servicemanager.getUniqueId #>
<# name := "SM-tiered-" $ uid #>
<# oname := "SM-O-tiered-" $ uid #>
```

```
classifier-list matchAll ip any any
rate-limit-profile <# name #> one-rate
    committed-rate <# inputBW; '\n' #>

policy-list <# name; '\n' #>
    classifier-group matchAll precedence 10000
        rate-limit-profile <# name; '\n' #>
        traffic-class best-effort

policy-list <# oname; '\n' #>
    classifier-group matchAll precedence 10000
        traffic-class best-effort

profile <# name; '\n' #>
    ip policy secondary-input <# name #> statistics enabled merge
    ip policy output <# oname #> statistics enabled merge
    qos-profile triplePlayIP
    qos-parameter maxSubscBW <# outputBW; '\n' #>

<# env.setResult("activate-profile", name) #>
<# env.setResult("secondary-input-stat-clacl", "matchAll") #>
<# env.setResult("output-stat-clacl", "matchAll") #>

<# endtmpl #>
```

Sample RADIUS Attributes

RADIUS Attribute	Tag	Value
username	none	client1@isp1.com
activate-service	1	tiered(1280000, 5120000)

Sample CLI Command

host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "tiered(1280000, 5120000)"**

Video-on-Demand Service Definition Example

The following example shows a sample service definition macro file that creates a video-on-demand service—the service provides bandwidth that meets the needs of video streams. The definition creates the bandwidth towards the subscriber and parameterizes the source of the video feed.

The sample CLI command shows an example of the **service-management owner-session** command that you can use to activate the service session.

```
!parameterizes download bandwidth and server address
<# videoMin(downloadBW, serverAddress) #>

<# uid := app.servicemanager.getUniqueId #>
<# name := "SM-video-" $ uid #>

classifier-list <# name #> ip any <# serverAddress #> 0.0.0.0

policy-list <# name; '\n' #>
    classifier-group <# name #> precedence 5000
        traffic-class video
```

```
profile <# name; '\n' #>
    ip policy output <# name #> statistics enabled merge
    qos-parameter maxVideoBW add <# downloadBW; '\n' #>
    exit

<# env.setResult("activate-profile", name) #>
<# env.setResult("output-stat-clacl", name) #>

<# endtmpl #>
```

Sample Owner ID

Owner	Owner ID	Value
AAA (RADIUS)	Acct-Session-ID (RADIUS attribute 44)	573498

Sample CLI Command

host1(config)#**service-management owner-session aaa 573498 service-session "videoMin(4500000, 192.168.23.58)"**

Voice-over-IP Service Definition Example

This example provides a voice-over-IP service. The service is a session border controller (SBC) media gateway (MG)-based service that has upstream and downstream components.

The IP address and port for both the subscriber and the opposite end of the phone call were originally negotiated with the SBC. The VoIP service learns the IP addresses and ports for both ends of the call, and then specifies that any traffic to either end is put in the voice traffic class.

```
!parameterizes source address and port, destination address and port, and protocol type
<# mgFlow(upDA, upDPort, downDA, downDPort, protType) #>

<# uid := app.servicemanager.getUniqueId #>
<# name := "SM-mgFlow-" $ uid #>
<# oname := "SM-O-mgFlow-" $ uid #>

classifier-list <# name #> <# protType #> any <#upDA #> 0.0.0.0 eq <# upDPort; '\n' #>
policy-list <# name; '\n' #>
    classifier-group <# name #> precedence 2000
        traffic-class voice
        forward

classifier-list <# oname #> <# protType #> any <#downDA #> 0.0.0.0 eq <# downDPort; '\n' #>
policy-list <# oname; '\n' #>
    classifier-group <# oname #> precedence 2000
        traffic-class voice
        forward

profile <# name; '\n' #>
    ip policy input <# name #> statistics enabled merge
    ip policy output <# oname #> statistics enabled merge

<# env.setResult("activate-profile", name) #>

<# endtmpl #>
```

Sample RADIUS Attributes

RADIUS Attribute	Tag	Value
username	none	client1@isp1.com
activate-service	1	mgFlow(10.10.10.10, 1234, 192.168.45.54, 1234, udp)

Sample CLI Command

host1(config)#**service-management subscriber-session client1@isp1.com interface atm 4/0.1 service-session "mgFlow(10.10.10.10, 1234, 192.168.45.54, 1234, udp)"**

Guided Entrance Service Example

The guided entrance service enables you to create a controlled Internet browsing environment. Guided entrance-based services, which are sometimes called *walled gardens* or *captive portals*, are becoming increasingly important offerings for service providers. When a subscriber logs in and opens a Web browser, the Service Manager guided entrance service transparently directs the subscriber to a specific Web site—at that Web site, the subscriber is presented with a selection of possible services to use. For example, a subscriber might be shown a Web site that offers services such as:

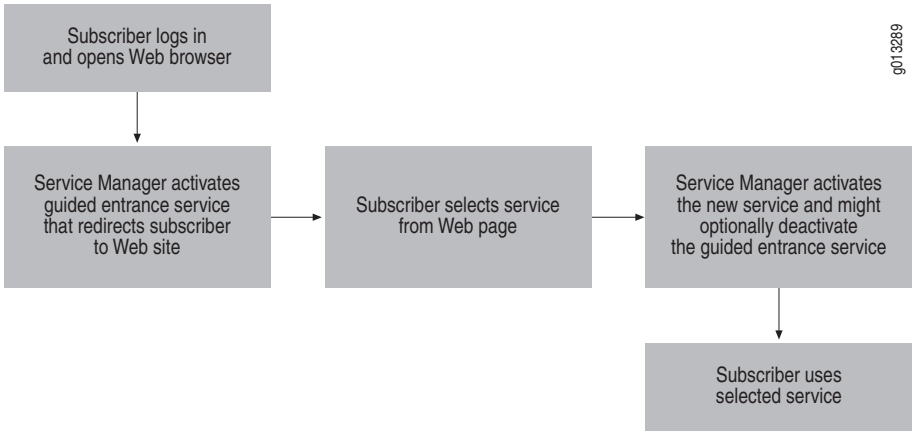
- Predefined services—A group of user-selectable services that meets a variety of needs of a single subscriber. The subscriber might select the high-priced highest access speed to perform critical financial transactions but select a lower speed (and lower cost) service for e-mail. For viewing a real-time sports event, the subscriber can select the video-on-demand service. The subscribers have control over the choice and cost of the services they need and use.

- Prepaid services—A group of specific services that have been prepaid by the subscriber. For example, a subscriber who has purchased the sports package service is presented with a Web page that lists the currently available sporting events. Or, a subscriber might prepay a VoIP service for a set amount of time.

- Controlled-service— An educational service that enables students at a school to access authorized research sites. Or, a limited service for young children that restricts access to safe, closely monitored, age-appropriate Web sites.

Figure 30 shows the sequence of actions that take place during a guided entrance service.

Figure 30: Guided Entrance



Service Manager requires additional configuration considerations for the guided entrance service.

- The **<# redirectUrlName := "http://" $ serverIp $ ":" $ serverPort #>** command in the service definition—Specifies the HTTP local service to which the subscriber is redirected after login. See *Guided Entrance Service Definition Example* on page 593 for a sample guided entrance service definition.

NOTE: You must also configure a policy that redirects packets. See *Creating an Exception Rule within a Policy Classifier Group* in *JUNOSe Policy Management Configuration Guide, Chapter 4, Creating Classifier Groups and Policy Rules* for information on creating redirect policies.

- HTTP local server application—Used by the policy in the activated service to direct a subscriber to a specific Web site when the subscriber logs in. See *Configuring the HTTP Local Server to Support Guided Entrance* on page 595 for information about the HTTP local server.

- RADIUS Dynamic Request Server and CoA messages—Enables RADIUS to dynamically activate the new service that the subscriber selects at the Web site. Can also optionally deactivate the original guided entrance service session that is used when the subscriber logs in. See *Chapter 4, Configuring RADIUS Dynamic-Request Server*.

Guided Entrance Service Definition Example

This example shows a guided entrance service. Upon login, the subscriber is redirected to a specific uniform resource locator (URL) at which the subscriber can choose from a list of available services.

```
!parameterizes server address and port
<# http(serverIp, serverPort) #>
```

```
<# serviceTag := "http-" #>
<# uid := app.servicemanager.getUniqueId #>
<# genericName := "SM-X-" $ serviceTag $ uid #>
<# genericInputName := "SM-I-" $ serviceTag $ uid #>
<# genericOutputName := "SM-O-" $ serviceTag $ uid #>
<# claclName := genericName #>

<# profileName := genericName #>
<# inputPolicyName := genericInputName #>
<# inputRateLimitName := genericInputName #>
<# outputPolicyName := genericOutputName #>
<# outputRateLimitName := genericOutputName #>

<# exceptionClaclName := "exceptionClaclPort" $ serverPort #>
<# serverClaclName := "serverClaclIp" $ serverIp #>
<# redirectUrlName := "http://" $ serverIp $ ":" $ serverPort #>

configure terminal

classifier-list <# serverClaclName #> ip any host <# serverIp; '\n' #>

classifier-list <# exceptionClaclName #> tcp any any eq <# serverPort; '\n' #>

ip policy-list <# inputPolicyName; '\n' #>
    classifier-group <# serverClaclName; '\n' #>
        forward
    classifier-group <# exceptionClaclName; '\n' #>
        exception http-redirect
    classifier-group *
        filter

profile <# profileName #>
    ip http redirectUrl <# redirectUrlName; '\n' #>
    ip policy input <# inputPolicyName #> statistics enabled merge

<# env.setResult("activate-profile", "" $ profileName) #>

<# endtmpl #>
```

Sample RADIUS Attributes

RADIUS Attribute	Tag	Value
username	none	client5@isp1.com
activate-service	1	http(192.168.25.2, 80)

Sample CLI Command

host1(config)#**service-management subscriber-session client5@isp1.com interface atm 5/0.1 service-session “http(192.168.25.2, 80)”**

Using CoA Messages with Guided Entrance Services

Typically, a guided entrance service directs a subscriber to a Web site, where the subscriber can select from a group of available services. When the subscriber selects a new service to use, Service Manager uses a RADIUS CoA message to activate the new service—you can also configure RADIUS to deactivate the original guided entrance service. To inform Service Manager to deactivate the original guided entry service, you must include the Deactivate-Service attribute in the RADIUS records of the services that can be selected from the Web site.

If you configure a guided entrance service, you must also ensure that the router's RADIUS dynamic-request server is enabled and supports CoA messages. See *Chapter 4, Configuring RADIUS Dynamic-Request Server*, for information about the RADIUS dynamic-request server and CoA messages.

Table 143 describes a partial RADIUS Access-Accept message for a guided entrance service and the CoA-Request message for the tiered service that the subscriber subsequently selects from the Web site. The CoA message for the tiered service includes the Deactivate-Service attribute that deactivates the guided entrance service.

Table 143: Deactivating a Guided Entrance Service

Guided Entrance Service Activated at Login

RADIUS Attribute	Tag	Value
username	none	client5@isp1.com
activate-service	1	http(192.168.25.2, 80)

Tiered Service Selected at Web Site

RADIUS Attribute	Tag	Value
username	none	client5@isp1.com
activate-service	2	tiered(1280000, 5120000)
deactivate-service		http(192.168.25.2, 80)
service-timeout	2	720
service-statistics	2	2

Configuring the HTTP Local Server to Support Guided Entrance

JUNOSe software supports an embedded Web server, known as the HTTP local server, which is used to support the Service Manager application's guided entrance service. With guided entrance, subscribers are directed to a specific Web site when they log in. At the Web site, the subscribers can then select the service they want to use.

You can configure one HTTP local server per virtual router. The HTTP local server is disabled by default. To configure the HTTP local server:

1. Access the virtual router context.

   host1(config)#**virtual-router west400**
   host1:west400(config)#

2. Create the HTTP local server.

   host1:west40(config)#**ip http**

3. (Optional) Specify a standard IP access list that defines which subscribers can connect to the HTTP local server.

   host1:west40(config)#**ip http access-class chicagoList**

4. (Optional) Specify the port on which the HTTP local server receives connection attempts.

   host1:west40(config)#**ip http port 8080**

5. (Optional) Specify the maximum number of connections that can exist between one IP address and the HTTP local server.

   host1:west40(config)#**ip http same-host-limit 20**

6. Specify the maximum time that HTTP local servers maintain connections.

   host1:west40(config)#**ip http max-connection-time 1000**

7. Enable the HTTP local server.

   host1:west40(config)#**ip http server**

8. Configure the HTTP redirect feature for the profile, interface, or subinterface that will be referenced in the guided entrance service definition.

   host1:west40(config)#**profile guidEnt6**
   host1:west40(config-profile)#**ip http redirectUrl http://ispsite.redirect.com**

HTTP Local Server Commands

This section describes the commands used to configure the HTTP local server application on the E-series router.

ip http

- Use to create the HTTP local server.
- Example

  host1(config)#**ip http**

- Use the **no** version to delete the HTTP local server.

ip http access-class

- Use to allow only subscribers on the specified standard IP access list to connect to the HTTP local server.
- Example

  host1(config)#**ip http access-class chicagoList**

- Use the **no** version to remove the association between the access list and the HTTP local server.

ip http max-connection-time

- Use to specify the maximum time that the HTTP local server maintains an inactive connection.
- Specify a time in the range 3–7200 seconds, or 0. A value of 0 causes the server to maintain an inactive connection indefinitely.
- Example

  host1(config)#**ip http max-connection-time 1000**

- Use the **no** version to restore the default time, 30 seconds.

ip http port

- Use to specify the port on which the HTTP local server receives connection attempts.
- Specify a port number in the range 1–65535.
- Example

  host1(config)#**ip http port 8080**

- Use the **no** version to restore the default port number, 80.

ip http redirectUrl

- Use to specify the URL to which a subscriber's HTTP access session is redirected.
- The first access session is typically used by the Service Manager application to provide initial provisioning and service selection for the subscriber.
- HTTP redirect is per-interface; use the command in Profile Configuration mode for dynamic interfaces; use the command in Interface Configuration mode or Subinterface Configuration mode for static interfaces.
- The redirect URL can be a maximum of 64 characters.

NOTE: The HTTP local server must be configured and enabled in the virtual router for the interface on which you use the **ip http redirectUrl** command. Otherwise, the URL redirect operation will fail.

- Example

  host1(config-if)#**ip http redirectUrl http://ispsite.redirect.com**

- Use the **no** version to restore the default, which disables the HTTP redirect feature.

ip http same-host-limit

- Use to specify the maximum number of connections that can exist between one IP address and the HTTP local server.
- Specify a number in the range 0–1000.
- Example

  host1(config)#**ip http same-host-limit 20**

- Use the **no** version to restore the default number of allowed connections, 3.

ip http server

- Use to enable the HTTP local server.
- Example

  host1(config)#**ip http server**

- Use the **no** version to disable the HTTP local server.

Chapter 28

Monitoring Service Manager

This chapter describes how to monitor the Service Manager application. This chapter discusses the following topics:

Setting a Baseline for HTTP Local Server Statistics

You can set a baseline for HTTP server statistics.

The system implements the baseline by reading and storing the statistics at the time the baseline is set and then subtracting this baseline whenever baseline-relative statistics are retrieved.

To set a baseline:

- Include the **baseline ip http** command at the User Exec or Privilege Exec level:

  host1#**baseline ip http**

There is no **no** version.

Related Topics

- Monitoring Statistics for Connections to the HTTP Local Server on page 601
- **baseline ip http** command

Monitoring the Connections to the HTTP Local Server

Purpose Display information about the connections to the HTTP local server.

Action To display information about the HTTP local server:

```
host1#show ip http scalar
  Maximum connection length: 1000 seconds
  Current number of http servers: 5
  Number of enabled http servers: 2
  Current number of http connections: 15
  Peak number of http connections: 125
  Maximum number of http connections: 1000
```

Meaning Table 144 lists the **show ip http scalar** command output fields.

Table 144: show ip http scalar Output Fields

Field Name	Field Description
Maximum connection length	Maximum time that the HTTP local server maintains an inactive connection, in seconds
Current number of http servers	Number of configured Web servers
Number of enabled http servers	Number of Web servers enabled
Current number of http connections	Number of connections from subscribers to HTTP local servers
Peak number of http connections	Highest number of connections from subscribers to HTTP local servers
Maximum number of http connections	Maximum number of connections allowed from subscribers to HTTP local servers

Related Topics

- **show ip http scalar** command

Monitoring the Configuration of the HTTP Local Server

Purpose Display information about the configuration of the HTTP local server.

Action To display information about the HTTP local server:

```
host1#show ip http server
  Admin status: enabled
  Access class: not defined
  Listening port: 80
  Same host limit: 3
```

Meaning Table 145 lists the **show ip http server** command output fields.

Table 145: show ip http server Output Fields

Field Name	Field Description
Admin status	Status of the HTTP local server in the software: enabled or disabled
Access class	Name of a standard IP access list that determines which hosts can log on to the HTTP local server
Listening port	Port that the HTTP local server uses to track requests for connection
Same host limit	Maximum number of connections allowed between one IP address and the DHCP local server

Related Topics

- **show ip http server** command

Monitoring Statistics for Connections to the HTTP Local Server

Purpose Display statistics about the connections to the HTTP local server.

Action To display statistics about HTTP local server with the baseline values subtracted:

```
host1#show ip http statistics delta
  Server enable count: 1
  Server disable count: 0
  Same host enforced: 0
  Access class denies: 0
  No resource failures: 0
  Http connections created: 2
  Http connections terminated: 2
  Http connections aged out: 1
  Urls successfully served: 0
  Malformed http requests: 0
  Urls not found: 0
```

Meaning Table 146 lists the **show ip http statistics** command output fields.

Table 146: show ip http statistics Output Fields

Field Name	Field Description
Server enable count	Total number of enabled HTTP local servers
Server disable count	Total number of disabled HTTP local servers
Same host enforced	Number of connections dropped because the limit for connections from one IP address to the HTTP local server was exceeded
Access class denies	Number of connections dropped because of a problem with the standard IP access list that defines the hosts that can access the HTTP local server
No resource failures	Number of connections dropped because of system memory limitations
Http connections created	Total number of HTTP connections established
Http connections terminated	Total number of HTTP connections ended
Http connections aged out	Total number of HTTP connections that expired because they exceeded the maximum allowed connection time
Urls successfully served	Total number of Web pages displayed
Malformed http requests	Number of HTTP requests that failed because the format was incorrect
Urls not found	Number of Web pages not found

Related Topics

- **show ip http statistics** command

Monitoring Profiles for the HTTP Local Server

Purpose Display information about the redirect URL used for guided entrance services.

Action To display information about the redirect URL used by the HTTP local server:

```
host1#show profile name guidedProfile2
Profile                    : guidedProfile2
.
.
.
Auto Detect                : Disabled
Auto Configure             : Disabled
IP FlowStats               : Disabled


Ip http redirect Url : myredirect.html
```

Meaning Table 147 lists the **show profile** command output fields.

Table 147: show profile Output Fields

Field Name	Field Description
Ip http redirect Url	URL of the Web page used for Service Manager guided entrance services

Related Topics

- **show profile** command

Monitoring the Default Interval for Interim Accounting of Services

Purpose Display the default interval used for interim accounting for services associated with users on the virtual router. An entry of 0 indicates that the feature is disabled.

Action To display the default interval used for interim accounting:

```
host1:vrXyz7#show aaa service accounting interval
service-acct-interval 60
```

Meaning Table 148 lists the **show aaa service accounting interval** command output fields.

Table 148: show aaa service accounting interval Output Fields

Field Name	Field Description
service-acct-interval	Value of the default interval

Related Topics

- **show aaa service accounting interval** command

Monitoring the Status of the Service Manager License

Purpose Display the status of the Service Manager license.

Action To display the status of the Service Manager license:

```
host1#show license service-management
service management license is set
```

Meaning Table 149 lists the **show license service-management** command output fields.

Table 149: show license service-management Output Fields

Field Name	Field Description
service management license	Status of the license: set (enabled) or not set (disabled)

Related Topics

- **show license service-management** command

Monitoring Profiles for Service Manager

Purpose Display information about the policies and QoS configurations referenced in profiles.

Action To display information about a specific profile:

```
host1#show profile name video
IP Output Policy           : video statistics disabled
IP Secondary Input Policy  : video statistics disabled
qos-parameter vidburst 1000
qos-parameter vidrate 500000
qos-profile vid512k

host1#show profile name foo

IP Policy Parameter foo : 100000 increase, reference rate
IP Input Policy            : p1 statistics disabled

ERX-00-16-c2#show profile name p2

IP Policy Parameter foo : 100000, reference rate
IP Input Policy            : p1 statistics disabled
```

To display a list of profiles configured on the router:

```
host1#show profile brief
```

Meaning Table 150 lists the **show profile** command output fields.

Table 150: show profile Output Fields

Field Name	Field Description
Input Policy	Name of input policy and whether statistics are enabled or disabled
Output Policy	Name of output policy and whether statistics are enabled or disabled
qos-parameter	Name and value of the QoS parameter assigned to the profile
qos-profile	Name of the QoS profile assigned to the profile

Related Topics

- **show profile** command

Monitoring QoS Parameters for Service Manager

Purpose Display the Service Manager references for parameters for QoS clients.

Action To display information in expanded format, including Service Manager references:

```
host1#show qos-parameter video references full
                                          service
                  parameter               manager
    interface       name    value source   refs   persistence
----------------- --------- ----- ------- ------- -----------
GigabitEthernet6/0 video      50   default  none    persistent

  Global parameter instances:   0
  Parameter instances reported: 1
```

Meaning Table 151 lists the **show qos-parameter** command output fields.

Table 151: show qos-parameter Output Fields

Field Name	Field Description
interface	Location of the interface to which the parameter instance is assigned; global indicates that the parameter is assigned to the chassis
parameter name	Name of the parameter instance
value	Value assigned to the parameter instance
source	Source of the parameter instance: dcm—Parameter instance was created in a profile radius—Parameter instance was created through RADIUS service manager—Parameter instance was created through Service Manager default—Parameter instance was created through the CLI or SNMP
service manager refs	Number of references of this parameter instance created through Service Manager
persistence	Status of the persistence of a parameter instance in the system:persistent—Parameter instance is stored in NVS and is restored after a chassis reset non-persistent—Parameter instance is not stored in NVS and are deleted after a chassis reset
Global parameter instances	Number of parameter instances assigned to the chassis
Parameter instances reported	Total number of parameter instances assigned
Explicit parameter instances	Total number of explicit parameter instances assigned
Hierarchical parameter instances	Total number of hierarchical parameter instances assigned
IP multicast parameter instances	Total number of parameter instances associated with the IP multicast bandwidth adjustment application

Related Topics

- **show qos-parameter** command

Monitoring Service Definitions

Purpose Display information about the service definitions configured on your router.

Action To display information for the particular service definition, specify the name of a service definition macro file, including the .mac extension:

```
host1#show service-management service-definition tiered.mac
tiered.mac - WED DEC 14 14:41:20 2005
 Installed: True
 Service: tiered(inputbw, outputbw)
 Reference Count: 0
```

To display summary information for all service definitions:

```
host1#show service-management service-definition brief
                     Service Definitions
                     -------------------

                                                          Reference
 Filename             Service             Installed        Count
----------   -------------------------   ---------   ---------
video.mac    video(inputbw, outputbw)    True        0
tiered.mac   tiered(inputbw, outputbw)   True        0

 Filename           Timestamp
----------   ------------------------
video.mac    TUE NOV 15 15:22:00 2005
tiered.mac   WED DEC 14 14:41:20 2005
```

Meaning Table 152 lists the **show service-management service-definition** command output fields.

Table 152: show service-management service-definition Output Fields

Field Name	Field Description
Filename	Name of the service definition macro file
Service	Name of the service, with the parameter specifications in parentheses
Installed	Status of definition: ■ True—installed ■ False—not installed
Reference Count	Number of times the service definition has been used to instantiate a unique service instance (which identifies the policy, QoS, and profile objects for a service). For example, if one service session—such as, tiered(40000,40000)—is activated by multiple subscribers, the reference count is 1. However, if one subscriber activates tiered(40000,40000) and another subscriber activates tiered(75000,75000)—the reference count is 2.
Timestamp	Day, date, and time the service definition was copied to NVS.

Related Topics

- **show service-management service-definition** command

Monitoring Service Session Profiles

Purpose Display information about service session profiles configured on your router.

Action To display summary information for all service session profiles:

```
host1#show service-management service-session-profile brief
    Service Session Profiles
    ------------------------
Name      Volume   Time   Statistics
-------   ------   ----   ----------
tiered1   20000    1000   Volume-Time
tiered2   20000    1000   Time
video1    15000    1000   Volume-Time
video4    0        0      Disabled
```

To display information for a particular service session profile:

```
host1#show service-management service-session-profile tiered1
tiered1
 Time       : 1000
 Volume     : 20000
 Statistics : Time and Volume
```

Meaning Table 153 lists the **show service-management service-session-profile** command output fields.

Table 153: show service-management service-session-profile Output Fields

Field Name	Field Description
Name	Name of the service session profile
Volume	Volume threshold, in MB, for the service session
Time	Time threshold, in seconds, for the service session
Statistics	Type of statistics that are captured: ■ Disabled (none) ■ Time ■ Volume–Time ■ Time and Volume

Related Topics

- **show service-management service-session-profile** command

Monitoring Active Owner Sessions with Service Manager

Purpose Display information about active subscriber sessions, by owner.

Action To display summary information for all active owner sessions:

```
host1#show service-management owner-session brief
     Subscriber Sessions
     -------------------
                                                                  Service
     Name          Interface       Id   Owner/Id      State    Non-volatile  Sessions
----------------   -------------   --   ---------     ------   ------------  --------
CLIENT1@ISP.COM    ip192.168.0.3   1    AAA 4194326   Active   False         1
CLIENT2@ISP.COM    ip192.168.0.7   2    AAA 4194327   Active   False         1
CLIENT3@ISP.COM    ip192.168.0.4   3    AAA 4194328   Active   False         1
CLIENT4@ISP.COM    ip192.168.0.5   4    AAA 4194329   Active   False         1
CLIENT5@ISP.COM    ip192.168.0.6   5    AAA 4194330   Active   False         1
CLIENT6@ISP.COM    ip192.168.0.8   6    AAA 4194331   Active   False         1
CLIENT7@ISP.COM    ip192.168.0.1   7    AAA 4194332   Active   False         1
CLIENT8@ISP.COM    ip192.168.0.9   8    AAA 4194333   Active   False         1
```

To display information for a particular owner:

```
host1#show service-management owner-session aaa 4194326
User Name: CLIENT1@ISP.COM, Interface: ip 192.168.0.1
 Owner/Id: AAA/4194326
 Non-volatile: False
 State: Active
 ServiceSessions:
         Name             Owner/ID      State                 Operation
-----------------------   -----------   -------------------   ---------
tiered(2000000,3000000)   AAA 4194326   Config ApplySuccess   Activate
         Name             Non-volatile
-----------------------   ------------
tiered(2000000,3000000)   False
```

To display information for a particular owner with service session information:

```
host1#show service-management owner-session aaa 4194326 service-session
User Name: client1@isp.COM, Interface: ip192.168.0.1
Service : tiered(2000000,3000000)
 Non-volatile : False
 Owner : AAA 4194326
 State : Config ApplySuccess
 Activate : True
 Statistics Type : time-based and volume-based
 Statistics Complete : False
 Poll Interval : 0
 Poll Expire : 0
 Activate Time : THU MAR 02 01:21:26 2006
 Time : 0
 Time Expire : 0
 Volume MBytes: 2
 Volume Expire MBytes : 1
 Input Bytes : 594
 Output Bytes : 1196
 Input Packets : 1
 Output Packets : 2
```

Meaning Table 154 lists the **show service-management owner-session** command output fields.

Table 154: show service-management owner-session Output Fields

Field Name	Field Description
Name	Name of the subscriber or name of the service session
Interface	Type and IP address of the subscriber's interface
Owner/Id	Method used to activate the subscriber session (CLI, AAA) and ID number generated by the owner
State	Status of the subscriber session (active or inactive), or status of the service session
Non-volatile	Indicates whether the service session is stored in NVS; RADIUS-based service sessions are not stored in NVS
Service Sessions	Number of service sessions currently active for this subscriber
Operation	Last operation that Service Manager performed
Service	Name of the service, with parameter values in parentheses
Activate	Indicates whether the last operation was activate (True) or deactivate (False)
Statistics Type	Type of statistics collected; none, time, or volume-time
Statistics Complete	Whether statistics have been successfully collected; True or False
Poll Interval	Interval, in seconds, that interim statistics reports are sent
Poll Expire	Number of seconds until the next statistics report is sent
Activate Time	Day, date, and time when the service session was activated
Time	Time threshold value set by service session profile or RADIUS VSA
Time Expire	Time left until the threshold expires; this value starts as the time threshold value and is decremented as time passes
Volume	Volume threshold value set by service session profile or RADIUS VSA
Volume Expire	Volume left until the threshold is exceeded; this value starts as the volume threshold value and is decremented as the service statistics measure volume
Input Bytes	Current value of input bytes that the statistics configuration is measuring

Table 154: show service-management owner-session Output Fields (continued)

Field Name	Field Description
Output Bytes	Current value of output bytes that the statistics configuration is measuring
Input Packets	Current value of input packets that the statistics configuration is measuring
Output Packets	Current value of output packets that the statistics configuration is measuring

Related Topics

- **show service-management owner-session** command

Monitoring Active Subscriber Sessions with Service Manager

Purpose Display information about active subscriber sessions on your router.

Action To display summary information for all active subscriber sessions:

```
host1#show service-management subscriber-session brief
                          Subscriber Sessions
                          -------------------
                                                                          Service
     Name          Interface       Id   Owner/Id      State    Non-volatile  Sessions
----------------   --------------  --   ---------     ------   ------------  --------
CLIENT1@ISP.COM    ip192.168.0.3   1    AAA 4194326   Active   False         1
CLIENT2@ISP.COM    ip192.168.0.7   2    AAA 4194327   Active   False         1
CLIENT3@ISP.COM    ip192.168.0.4   3    AAA 4194328   Active   False         1
CLIENT4@ISP.COM    ip192.168.0.5   4    AAA 4194329   Active   False         1
CLIENT5@ISP.COM    ip192.168.0.6   5    AAA 4194330   Active   False         1
CLIENT6@ISP.COM    ip192.168.0.8   6    AAA 4194331   Active   False         1
CLIENT7@ISP.COM    ip192.168.0.1   7    AAA 4194332   Active   False         1
CLIENT8@ISP.COM    ip192.168.0.9   8    AAA 4194333   Active   False         1
CLIENT9@ISP.COM    ip192.168.0.2   9    AAA 4194334   Active   False         1
CLIENT10@ISP.COM   ip192.168.0.10  10   AAA 4194335   Active   False         1
```

To display information for that particular subscriber with the subscriber name:

```
host1#show service-management subscriber-session client1@isp.com interface ip 192.168.0.1
User Name: CLIENT1@ISP.COM, Interface: ip 192.168.0.1
 Id: 1
 Owner: AAA 4194326
 Non-volatile: False
 State: Active
 ServiceSessions:
         Name             mutex   Owner/Id      State                Operation
-----------------------   -----   -----------   ------------------   ---------
tiered(2000000,3000000)           AAA 4194326   ConfigApplySuccess   Activate
         Name             Non-volatile
-----------------------   ------------
tiered(2000000,3000000)   False
```

To display information for that particular subscriber with the service session:

```
host1#show service-management subscriber-session client1@isp.COM interface ip
192.168.0.1 service-session tiered
User Name: client1@isp.COM, Interface: ip192.168.0.1
Service : tiered(2000000,3000000)
 Non-volatile : False
 Owner : AAA 41943236
 State : Config ApplySuccess
 Activate : True
 Statistics Type : time-based and volume-based
 Statistics Complete : False
 Poll Interval : 0
 Poll Expire : 0
 Activate Time : THU MAR 02 01:21:26 2006
 Time : 0
 Time Expire : 0
 Volume MBytes: 2
 Volume Expire MBytes : 1
 Input Bytes : 594
 Output Bytes : 1196
 Input Packets : 1
 Output Packets : 2
```

To display information for a particular subscriber using the subscriber ID:

```
host1#show service-management subscriber-session 20

User Name: CLIENT50@ISP.COM, Interface: ip192.168.100.33
 Id: 20
 Owner/Id: CLI
 Non-volatile: True
 State: Active
 ServiceSessions:
      Name            mutex   Owner   State                Operation
------------------    -----   -----   ------------------   ---------
internet(5000,8000)      12   CLI     Config ApplySuccess   Activate

      Name            Non-volatile
------------------    ------------
internet(5000,8000)   True
```

Meaning Table 155 lists the **show service-management subscriber-session** command output fields.

Table 155: show service-management subscriber-session Output Fields

Field Name	Field Description
Name	Name of the subscriber or name of the service session
Interface	Type and IP address of the subscriber's interface
Id	ID number of the subscriber session
mutex	Index number of the mutex group to which the service session belongs
Owner/Id	Method used to activate the subscriber session (CLI, AAA) and ID number generated by the owner (Acct-Session-ID for AAA)

Table 155: show service-management subscriber-session Output Fields (continued)

Field Name	Field Description
State	Status of the subscriber session (active or inactive), or status of the service session
Non-volatile	Indicates whether the service session is stored in NVS; RADIUS-based service sessions are not stored in NVS
Service Sessions	Number of service sessions currently active for this subscriber
Operation	Last operation that Service Manager performed
Service	Name of the service, with parameter values in parentheses
Activate	Indicates whether the last operation was activate (True) or deactivate (False)
Statistics Type	Type of statistics collected; none, time, or volume-time
Statistics Complete	Whether statistics have been successfully collected; True or False
Poll Interval	Interval, in seconds, that interim statistics reports are sent
Poll Expire	Number of seconds until the next statistics report is sent
Activate Time	Day, date, and time when the service session was activated
Time	Time threshold value set by service session profile or RADIUS VSA
Time Expire	Time left until the threshold expires; this value starts as the time threshold value and is decremented as time passes
Volume	Volume threshold value set by service session profile or RADIUS VSA
Volume Expire	Volume left until the threshold is exceeded; this value starts as the volume threshold value and is decremented as the service statistics measure volume
Input Bytes	Current value of input bytes that the statistics configuration is measuring
Output Bytes	Current value of output bytes that the statistics configuration is measuring
Input Packets	Current value of input packets that the statistics configuration is measuring
Output Packets	Current value of output packets that the statistics configuration is measuring

Related Topics

- **show service-management subscriber-session** command

Monitoring the Number of Active Subscriber and Service Sessions with Service Manager

Purpose Display the total number of active subscriber and service sessions configured on your router.

Action To display the total number of active subscriber and service sessions:

```
host1#show service-management summary

Total Subscriber Sessions : 10

Total Service Sessions : 10
```

Meaning Table 156 lists the **show service-management subscriber-session** command output fields.

Table 156: show service-management subscriber-session Output Fields

Field Name	Field Description
Total Subscriber Sessions	Number of active subscriber sessions on the router
Total Service Sessions	Number of active service sessions on the router

Related Topics

- **show service-management summary** command

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