



Broadband Subscriber Management PPPoE Layer 3 Wholesale Solution



Published: 2012-02-28

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Documentation and Release Notes

To obtain the most current version of all Juniper Networks® technical documentation, see the product documentation page on the Juniper Networks website at <http://www.juniper.net/techpubs/>.

If the information in the latest release notes differs from the information in the documentation, follow the product Release Notes.

Juniper Networks Books publishes books by Juniper Networks engineers and subject matter experts. These books go beyond the technical documentation to explore the nuances of network architecture, deployment, and administration. The current list can be viewed at <http://www.juniper.net/books>.

Using the Examples in This Manual

If you want to use the examples in this manual, you can use the **load merge** or the **load merge relative** command. These commands cause the software to merge the incoming configuration into the current candidate configuration. The example does not become active until you commit the candidate configuration.

If the example configuration contains the top level of the hierarchy (or multiple hierarchies), the example is a *full example*. In this case, use the **load merge** command.

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

Merging a Full Example

To merge a full example, follow these steps:

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

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

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

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

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

Merging a Snippet

To merge a snippet, follow these steps:

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

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

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

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

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

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

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

For more information about the **load** command, see the [Junos OS CLI User Guide](#).

Documentation Conventions

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

Table 1: Notice Icons





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

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

Table 2: Text and Syntax Conventions

Convention	Description	Examples
Bold text like this	Represents text that you type.	To enter configuration mode, type the configure command: user@host> configure
Fixed-width text like this	Represents output that appears on the terminal screen.	user@host> show chassis alarms No alarms currently active
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces important new terms. Identifies book names. Identifies RFC and Internet draft titles. 	<ul style="list-style-type: none"> A policy <i>term</i> is a named structure that defines match conditions and actions. <i>Junos OS System Basics Configuration Guide</i> RFC 1997, <i>BGP Communities Attribute</i>

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

Convention	Description	Examples
<i>Italic text like this</i>	Represents variables (options for which you substitute a value) in commands or configuration statements.	Configure the machine's domain name: [edit] root@# set system domain-name <i>domain-name</i>
Text like this	Represents names of configuration statements, commands, files, and directories; interface names; configuration hierarchy levels; or labels on routing platform components.	<ul style="list-style-type: none"> To configure a stub area, include the stub statement at the [edit protocols ospf area area-id] hierarchy level. The console port is labeled CONSOLE.
< > (angle brackets)	Enclose optional keywords or variables.	stub <default-metric <i>metric</i> >;
(pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast multicast (<i>string1</i> <i>string2</i> <i>string3</i>)
# (pound sign)	Indicates a comment specified on the same line as the configuration statement to which it applies.	rsvp { # Required for dynamic MPLS only
[] (square brackets)	Enclose a variable for which you can substitute one or more values.	community name members [<i>community-ids</i>]
Indentation and braces ({ })	Identify a level in the configuration hierarchy.	[edit] routing-options { static { route default { nexthop <i>address</i> ; retain; } } }
;(semicolon)	Identifies a leaf statement at a configuration hierarchy level.	
J-Web GUI Conventions		
Bold text like this	Represents J-Web graphical user interface (GUI) items you click or select.	<ul style="list-style-type: none"> In the Logical Interfaces box, select All Interfaces. To cancel the configuration, click Cancel.
> (bold right angle bracket)	Separates levels in a hierarchy of J-Web selections.	In the configuration editor hierarchy, select Protocols>Ospf .

Documentation Feedback

We encourage you to provide feedback, comments, and suggestions so that we can improve the documentation. You can send your comments to techpubs-comments@juniper.net, or fill out the documentation feedback form at

<https://www.juniper.net/cgi-bin/docbugreport/> . If you are using e-mail, be sure to include the following information with your comments:

- Document or topic name
- URL or page number
- Software release version (if applicable)

Requesting Technical Support

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- JTAC policies—For a complete understanding of our JTAC procedures and policies, review the *JTAC User Guide* located at <http://www.juniper.net/us/en/local/pdf/resource-guides/7100059-en.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.

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

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

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

Opening a Case with JTAC

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

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

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

PART 1

Overview

- [Broadband Subscriber Management Basics Overview on page 3](#)
- [Broadband Subscriber Management Solution Hardware Overview on page 9](#)
- [Broadband Subscriber Management Solution Software Overview on page 15](#)
- [Broadband Subscriber Management PPPoE Wholesale Overview on page 19](#)

CHAPTER 1

Broadband Subscriber Management Basics Overview

- [Broadband Subscriber Management Overview on page 3](#)
- [Broadband Subscriber Management Platform Support on page 4](#)
- [Broadband Subscriber Management Solutions Terms and Acronyms on page 5](#)
- [Supporting Documentation for Broadband Subscriber Management on page 6](#)

Broadband Subscriber Management Overview

Broadband Subscriber Management is a method of dynamically provisioning and managing subscriber access in a multiplay or triple play network environment. This method uses AAA configuration in conjunction with dynamic profiles to provide dynamic, per-subscriber authentication, addressing, access, and configuration for a host of broadband services including Internet access, gaming, IPTV, Video on Demand (VoD), and subscriber wholesaling.



NOTE: The Junos OS broadband subscriber management solution currently supports Dynamic Host Configuration Protocols (DHCP)-based and Point-to-Point Protocol /Point-to-Point Protocol over Ethernet (PPP/PPPoE)-based configuration and RADIUS authentication and authorization.

This guide focuses on the general components necessary for configuring a Juniper Networks MX Series 3D Universal Edge Router to dynamically provision and manage subscribers. However, you can also use a Juniper Networks EX Series Ethernet Switch in a subscriber network.

Managing subscribers in a DHCP-based or PPP/PPPoE-based residential broadband network using an MX Series router requires the following:

- Planning and configuring a virtual LAN (VLAN) architecture for the access network.
- Configuring an authentication, authorization, and accounting (AAA) framework for subscriber authentication and authorization through external servers (for example, RADIUS) as well as accounting and dynamic-request change of authorization (CoA)

and disconnect operations through external servers, and address assignment through a combination of local address-assignment pools and RADIUS.

- Configuring DHCP local server or DHCP relay for subscriber address assignment for DHCP-based networks.
- Configuring address assignment pools for PPPoE-based networks.
- Configuring dynamic profiles to include dynamic IGMP, firewall filter, and class of service (CoS) configuration for subscriber access.
- Configuring multicast access to the core network.

To better understand the subscriber access network, this guide also provides general information about some hardware not from Juniper Networks and suggests methods for choosing different network configuration options. You can configure a subscriber network in many different ways. This guide does not cover all configuration scenarios. It is intended as a starting point for understanding subscriber management and how you can use Juniper Networks hardware and software to plan and build your own subscriber management solution.

**Related
Documentation**

- [Broadband Subscriber Management Platform Support on page 4](#)
- [Broadband Subscriber Management Network Topology Overview](#)
- [Broadband Subscriber Management Solutions Terms and Acronyms on page 5](#)
- [Supporting Documentation for Broadband Subscriber Management on page 6](#)
- [Triple Play and Multiplay Overview](#)
- [Broadband History](#)

Broadband Subscriber Management Platform Support

Juniper Networks currently supports DHCP and PPP/PPPoE broadband subscriber management solutions on MX Series routers and PPP/PPPoE broadband subscriber management solutions on M120 and M320 routers.



NOTE: This guide describes configuration on MX Series routers.

**Related
Documentation**

- [Broadband Subscriber Management Overview on page 3](#)
- [Broadband Subscriber Management Edge Router Overview on page 9](#)

Broadband Subscriber Management Solutions Terms and Acronyms

- **AAA (authentication, authorization, and accounting)**—An IP-based networking system that controls user access to computer resources and manages the activity of users over a network.
- **ASM (Any Source Multicast)**—A method of allowing a multicast receiver to listen to all traffic sent to a multicast group, regardless of its source.
- **BSR (broadband services router)**—A router used for subscriber management and edge routing.
- **CoA (change of authorization)**—RADIUS messages that contain information for dynamically changing session authorizations.
- **CoS (class of service)**—A method of managing network traffic by grouping similar types of traffic together and treating each traffic type as a “class” with a defined service priority.
- **DHCP (Dynamic Host Configuration Protocol)**—A mechanism through which hosts using TCP/IP can obtain protocol configuration parameters automatically from a DHCP server on the network; allocates IP addresses dynamically so that they can be reused when no longer needed.
- **IGMP (Internet Group Membership Protocol)**—A host-to-router signaling protocol for IPv4 used to support IP multicasting.
- **IS-IS (Intermediate System-to-Intermediate System)**—A link-state interior gateway routing protocol (IGRP) for IP networks that uses the shortest-path-first (SPF) algorithm to determine routes.
- **LSP (label-switched path)**—The path traversed by a packet that is routed by MPLS. Some LSPs act as tunnels. LSPs are unidirectional, carrying traffic only in the downstream direction from an ingress node to an egress node.
- **MPLS (Multiprotocol Label Switching)**—A mechanism for engineering network traffic patterns that functions by assigning to network packets short labels that describe how to forward the packets through the network.
- **MSAN (multiservice access node)**—A group of commonly used aggregation devices including digital subscriber line access multiplexers (DSLAMs) used in xDSL networks, optical line termination (OLT) for PON/FTTx networks, and Ethernet switches for Active Ethernet connections.
- **Multiplay**—A networking paradigm that enables the ability to add new and robust networking services that individual subscribers can access.
- **OIF (outgoing interface)**—An interface used by multicast functions within a router to determine which egress ports to use for forwarding multicast groups.
- **OSPF (Open Shortest Path First)**—A link-state interior gateway protocol (IGP) that makes routing decisions based on the shortest-path-first (SPF) algorithm (also referred to as the Dijkstra algorithm).

- **PIM (Protocol Independent Multicast)**—A multicast routing protocol used for delivering multicast messages in a routed environment.
- **PPP (Point-to-Point Protocol)**—A link-layer protocol that provides multiprotocol encapsulation. PPP is used for link-layer and network-layer configuration. Provides a standard method for transporting multiprotocol datagrams over point-to-point links.
- **PPPoE (Point-to-Point Protocol over Ethernet)**—A network protocol that encapsulates PPP frames in Ethernet frames and connects multiple hosts over a simple bridging access device to a remote access concentrator.
- **RADIUS (Remote Authentication Dial-In User Service)**—A networking protocol that provides centralized access, authorization, and accounting management for subscribers to connect and use a network service.
- **Residential gateway**—A firewall, Network Address Translation (NAT) router, or other routing device used as a customer premises equipment (CPE) terminator in the home, office, or local point of presence (POP).
- **SSM (single-source multicast)**—A routing method that allows a multicast receiver to detect only a specifically identified sender within a multicast group.
- **set-top box**—The end host or device used to receive IPTV video streams.
- **Triple play**—A networking paradigm that dedicates bandwidth to data, voice, and video service.
- **VOD (video on demand)**—A unicast streaming video offering by service providers that enables the reception of an isolated video session per user with rewind, pause, and similar VCR-like capabilities.
- **VSR (video services router)**—A router used in a video services network to route video streams between an access network and a metro or core network. The video services router is any M Series Multiservice Edge Router or MX Series router that supports the video routing package provided with Junos OS Release 8.3 or later.

**Related
Documentation**

- [Broadband Subscriber Management Overview on page 3](#)

Supporting Documentation for Broadband Subscriber Management

The *Junos OS Broadband Subscriber Management Solutions Guide* relies heavily on existing configuration documentation. In particular, this guide references configuration material presented in the *Junos OS Subscriber Access Configuration Guide*. We recommend you become familiar with the configuration options presented for subscriber access before reading this guide.

Several guides in the Junos OS documentation set provide detailed configuration information that is not fully covered in this guide. This guide might reference other Junos OS configuration and solutions documents that can provide more detail about a specific feature or configuration option.

For more detailed configuration information, see the following Junos OS documents:

- [*Junos OS Subscriber Access Configuration Guide*](#)
- [*Junos OS Layer 2 Configuration Guide*](#)
- [*Junos OS Multicast Protocols Configuration Guide*](#)
- [*Junos OS Network Interfaces Configuration Guide*](#)
- [*Junos OS Policy Framework Configuration Guide*](#)

For other solution examples, see the following Junos OS solutions guides:

- [*Junos OS MX Series 3D Universal Edge Routers Solutions Guide*](#)
- [*Session Border Control Solutions Guide Using BGF and IMSG*](#)

In addition to related Junos OS documentation, you can obtain useful information from the JunosE Software documentation. Many features described in the *JunosE Broadband Access Configuration Guide* are similar to those described in both this guide and the [*Junos OS Subscriber Access Configuration Guide*](#).

**Related
Documentation**

- [Broadband Subscriber Management Overview on page 3](#)

CHAPTER 2

Broadband Subscriber Management Solution Hardware Overview

- [Broadband Subscriber Management Edge Router Overview on page 9](#)
- [Multiservice Access Node Overview on page 11](#)
- [Ethernet MSAN Aggregation Options on page 13](#)

Broadband Subscriber Management Edge Router Overview

The edge router is the demarcation point between the residential broadband access network and the core network. The Juniper Networks MX Series router (along with the Juniper Networks EX Series Ethernet Switch) can play multiple roles as an edge router. The most common include the following:

- **Broadband services router (BSR)**—This router supports high speed Internet access along with several other subscriber-based services including VoIP, IPTV, and gaming.
- **Video services router (VSR)**—The video services router capabilities are a subset of those provided by a broadband services router. In general, using the MX Series router as a video services router provides bi-directional traffic destined for the set-top box (STB). This traffic includes IPTV and video on demand (VoD) streams as well as associated control traffic such as IGMP and electronic program guide (EPG) updates.

You can also use the MX Series router in certain Layer 2 solutions. For information about configuring the MX Series router in Layer 2 scenarios, see the [Junos OS Layer 2 Configuration Guide](#) or the [Junos OS MX Series 3D Universal Edge Routers Solutions Guide](#).

Broadband Services Router Overview

A broadband services router is an edge router that traditionally supports primarily Internet-bound traffic. This router replaces and provides a superset of the functionality provided by a Broadband Remote Access Server (B-RAS). The broadband services router functions can be broken into two key areas—high speed Internet access and IPTV support.

High-Speed Internet Access Support

The broadband services router communicates with the RADIUS server to enforce which services each subscriber can access. For example, one subscriber might have signed up for a smaller Internet access service of 1 Mbps where another subscriber might have

signed up for a higher, 10 Mbps service. The broadband services router manages the traffic to each subscriber, ensuring that each subscriber obtains the level of access service they have purchased, while also ensuring that any VoIP traffic receives priority. The broadband services router also makes traffic forwarding decisions based on aggregate bandwidth detected on any adjacent multiservice access node (MSAN).

IPTV Support

The broadband services router supports IPTV traffic including support for IGMP multicast group start and stop requests from downstream MSANs. The broadband services router manages the bandwidth allocations associated with high-bandwidth IPTV as well as video on demand (VoD) traffic to ensure high quality service delivery.

Video Services Router

When configuring a multiedge network, you can use the MX Series router as a video services router (VSR) to support only video traffic without supporting the high-speed Internet access (HSIA) capabilities.



NOTE: We recommend a single-edge network model but the MX Series router allows for flexibility when defining a multiplay network topology.

Some advantages of using a separate video services router for video traffic include the following:

- Provides the ability to add IPTV service without the need to modify an existing edge router that is performing other functions.
- Reduces network bandwidth by moving the video edge further out to the network edge while still allowing for centralized broadband services router operation.
- Typically requires less capital investment because the video services router does not need to provide per-subscriber management.

Services Router Placement

Depending on the type of network you are creating—single edge or multiedge—you can place a broadband services router or video services router in various locations.

Single-Edge Placement

In a single-edge network, you use only broadband services routers because the single device must perform all of the necessary edge functions—providing subscriber management for high-speed Internet access and IPTV services. You can use the two following topology models when placing the broadband services router:

- **Centralized single edge**—The edge router is centrally located and placed at one location to cover a particular region. A secondary router is sometimes placed in this location to act as a backup. Downstream MSANs are connected to the broadband services router using a ring or mesh topology.

- **Distributed single edge**—The edge router is placed further out into the network, typically in the central office (CO) closest to the subscribers that it services. Downstream MSANs are typically connected directly to the broadband services router (in a true, single edge topology) or through an Ethernet aggregation switch.

In general, the addition of IPTV service favors a more distributed model because it pushes the need for subscriber management farther out into the network.

Multiedge Placement

In a multiedge network, you use both broadband services routers and video services routers. The broadband services router controls any high-speed Internet traffic and the video services router controls video traffic. You can use the two following topology models when placing service routers in a multiedge network topology:

- **Co-located multiedge**—The broadband services router and video services router are housed in the same location and an Ethernet switch directs traffic in the CO to the appropriate edge router.



NOTE: A single MX Series router can serve as both Ethernet switch and video services router. For information about configuring the MX Series router in Layer 2 scenarios, see the [Junos OS Layer 2 Configuration Guide](#) or the [Junos OS MX Series 3D Universal Edge Routers Solutions Guide](#).

- **Split multiedge**—The video services router and broadband services router reside in different locations. In this model, the broadband services router is typically located more centrally and video services routers are distributed.

Related Documentation

- [Multiservice Access Node Overview on page 11](#)
- [Ethernet MSAN Aggregation Options on page 13](#)
- [Broadband Subscriber Management Platform Support on page 4](#)

Multiservice Access Node Overview

A *multiservice access node* is a broader term that refers to a group of commonly used aggregation devices. These devices include digital subscriber line access multiplexers (DSLAMs) used in xDSL networks, optical line termination (OLT) for PON/FTTx networks, and Ethernet switches for Active Ethernet connections. Modern MSANs often support all of these connections, as well as providing connections for additional circuits such as plain old telephone service (referred to as POTS) or Digital Signal 1 (DS1 or T1).

The defining function of a multiservice access node is to aggregate traffic from multiple subscribers. At the physical level, the MSAN also converts traffic from the *last mile technology* (for example, ADSL) to Ethernet for delivery to subscribers.

You can broadly categorize MSANs into three types based on how they forward traffic in the network:

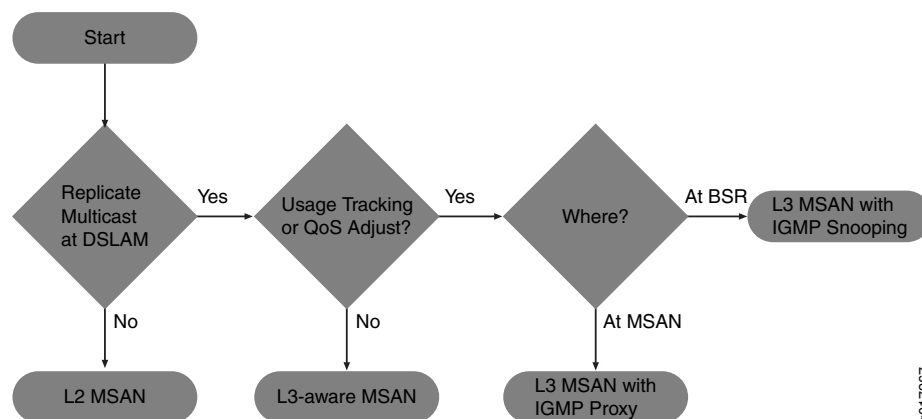
- **Layer–2 MSAN**—This type of MSAN is essentially a Layer 2 switch (though typically not a fully functioning switch) with some relevant enhancements. These MSANs use Ethernet (or ATM) switching to forward traffic. The MSAN forwards all subscriber traffic upstream to an edge router that acts as the centralized control point and prevents direct subscriber-to-subscriber communication. Ethernet Link Aggregation (LAG) provides the resiliency in this type of network.

Layer 2 DSLAMs cannot interpret IGMP, so they cannot selectively replicate IPTV channels.

- **Layer–3 aware MSAN**—This IP-aware MSAN can interpret and respond to IGMP requests by locally replicating a multicast stream and forwarding the stream to any subscriber requesting it. Layer 3 awareness is important when supporting IPTV traffic to perform channel changes (sometimes referred to as *channel zaps*). Static IP-aware MSANs always receive all multicast television channels. They do not have the ability to request that specific channels be forwarded to the DSLAM. Dynamic IP-aware DSLAMs, however, can inform the network to begin (or discontinue) sending individual channels to the DSLAM. Configuring IGMP proxy or IGMP snooping on the DSLAM accomplishes this function.
- **Layer–3 MSAN**—These MSANs use IP routing functionality rather than Layer 2 technologies to forward traffic. The advantage of this forwarding method is the ability to support multiple upstream links going to different upstream routers and improving network resiliency. However, to accomplish this level of resiliency, you must assign a separate IP subnetwork to each MSAN, adding a level of complexity that can be more difficult to maintain or manage.

In choosing a MSAN type, refer to [Figure 1 on page 12](#):

Figure 1: Choosing an MSAN Type



Related Documentation

- [Ethernet MSAN Aggregation Options on page 13](#)

Ethernet MSAN Aggregation Options

Each MSAN can connect directly to an edge router (broadband services router or video services router), or an intermediate device (for example, an Ethernet switch) can aggregate MSAN traffic before being sent to the services router. [Table 3 on page 13](#) lists the possible MSAN aggregation methods and under what conditions they are used.

Table 3: Ethernet MSAN Aggregation Methods

Method	When Used
Direct connection	Each MSAN connects directly to the broadband services router and optional video services router.
Ethernet aggregation switch connection	Each MSAN connects directly to an intermediate Ethernet switch. The switch, in turn, connects to the broadband services router or optional video services router.
Ethernet ring aggregation connection	Each MSAN connects to a ring topology of MSANs. The head-end MSAN (the device closest to the upstream edge router) connects to the broadband services router.

You can use different aggregation methods in different portions of the network. You can also create multiple layers of traffic aggregation within the network. For example, an MSAN can connect to a central office terminal (COT), which, in turn, connects to an Ethernet aggregation switch, or you can create multiple levels of Ethernet aggregation switches prior to connecting to the edge router.

Direct Connection

In the direct connection method, each MSAN has a point-to-point connection to the broadband services router. If an intermediate central office exists, traffic from multiple MSANs can be combined onto a single connection using wave-division multiplexing (WDM). You can also connect the MSAN to a video services router. However, this connection method requires that you use a Layer 3 MSAN that has the ability to determine which link to use when forwarding traffic.

When using the direct connection method, keep the following in mind:

- We recommend this approach when possible to simplify network management.
- Because multiple MSANs are used to connect to the services router, and Layer 3 MSANs generally require a higher equipment cost, this method is rarely used in a multiedge subscriber management model.
- Direct connection is typically used when most MSAN links are utilized less than 33 percent and there is little value in combining traffic from multiple MSANs.

Ethernet Aggregation Switch Connection

An Ethernet aggregation switch aggregates traffic from multiple downstream MSANs into a single connection to the services router (broadband services router or optional video services router).

When using the Ethernet aggregation switch connection method, keep the following in mind:

- Ethernet aggregation is typically used when most MSAN links are utilized over 33 percent or to aggregate traffic from lower speed MSANs (for example, 1 Gbps) to a higher speed connection to the services router (for example, 10 Gbps).
- You can use an MX Series router as an Ethernet aggregation switch. For information about configuring the MX Series router in Layer 2 scenarios, see the [Junos OS Layer 2 Configuration Guide](#) or the [Junos OS MX Series 3D Universal Edge Routers Solutions Guide](#).

Ring Aggregation Connection

In a ring topology, the remote MSAN that connects to subscribers is called the remote terminal (RT). This device can be located in the outside plant (OSP) or in a remote central office (CO). Traffic traverses the ring until it reaches the central office terminal (COT) at the head-end of the ring. The COT then connects directly to the services router (broadband services router or video services router).



NOTE: The RT and COT must support the same ring resiliency protocol.

You can use an MX Series router in an Ethernet ring aggregation topology. For information about configuring the MX Series router in Layer 2 scenarios, see the [Junos OS Layer 2 Configuration Guide](#) or the [Junos OS MX Series 3D Universal Edge Routers Solutions Guide](#).

Related Documentation

- [Multiservice Access Node Overview on page 11](#)

CHAPTER 3

Broadband Subscriber Management Solution Software Overview

- [Broadband Subscriber Management VLAN Architecture Overview on page 15](#)
- [AAA Service Framework and Broadband Subscriber Management Overview on page 17](#)

Broadband Subscriber Management VLAN Architecture Overview

The subscriber management logical network architecture is as important as the physical network architecture. You configure the logical portion of the subscriber management network using virtual local area networks (VLANs).

Three VLAN models deliver multiple services to subscribers. These models include the following:

- **Service VLAN**—The service VLAN (S-VLAN) provides many-to-one (N:1) subscriber-to-service connectivity: The service VLAN carries a service (for example, data, video, or voice) to all subscribers instead of having different services share a VLAN. Adding a new service requires adding a new VLAN and allocating bandwidth to the new service. The service VLAN model enables different groups that are using the broadband network (for example, external application providers) to manage a given service. One limitation of service VLANs is the absence of any logical isolation between user sessions at the VLAN level. This lack of isolation requires that the multiservice access node (MSAN) and broadband services router provide the necessary security filtering.
- **Customer VLAN**—The customer VLAN (C-VLAN) provides one-to-one (1:1) subscriber-to-service connectivity: One VLAN carries all traffic to each subscriber on the network. Having a single VLAN per subscriber simplifies operations by providing a 1:1 mapping of technology (VLANs) to subscribers. You can also understand what applications any subscriber is using at any given time. Because you use only one VLAN to carry traffic to each subscriber, this approach is not affected when adding new services. However, using a pure C-VLAN model consumes more bandwidth because a single television channel being viewed by multiple subscribers is carried across the network several times—once on each C-VLAN. This approach requires a more scalable, robust edge router that can support several thousand VLANs.
- **Hybrid C-VLAN**—The hybrid VLAN combines the best of both previous VLANs by using one VLAN per subscriber to carry unicast traffic and one shared multicast VLAN

(M-VLAN) for carrying broadcast (multicast) television traffic. You can use both the *pure* and *hybrid* C-VLAN models in different portions of the network, depending upon available bandwidth and MSAN capabilities.



NOTE: The term *C-VLAN*, when used casually, often refers to a *hybrid* C-VLAN implementation.

We recommend using one of the C-VLAN models to simplify configuration and management when expanding services. However, some MSANs are limited to the number of VLANs they can support, limiting the ability to use either C-VLAN model.



NOTE: Most MSANs can support the service VLAN model.

Broadband Subscriber Management VLANs Across an MSAN

You configure VLANs to operate between the MSAN and the edge router (broadband services router or video services router). However, the MSAN might modify VLAN identifiers before forwarding information to the subscriber in the following ways:



NOTE: Not all MSANs support these options.

- The VLAN identifiers can be carried within the ATM VCs or they can be removed. The value of keeping the VLAN header is that it carries the IEEE 802.1p Ethernet priority bits. These priority bits can be added to upstream traffic by the residential gateway, allowing the DSLAM to easily identify and prioritize more important traffic (for example, control and VoIP traffic). Typically, a VLAN identifier of zero (0) is used for this purpose.
- In a C-VLAN model, the MSAN might modify the VLAN identifier so that the same VLAN is sent to each subscriber. This enables the use of the same digital subscriber line (DSL) modem and residential gateway configuration for all subscribers without the need to define a different VLAN for each device.

Customer VLANs and Ethernet Aggregation

The 12-bit VLAN identifier (VLAN ID) can support up to 4095 subscribers. When using an aggregation switch with a C-VLAN topology, and fewer than 4095 subscribers are connected to a single edge router port, the aggregation switch can transparently pass all VLANs. However, if the VLAN can exceed 4095 subscribers per broadband services router port, you must use VLAN stacking (IEEE 802.1ad, also known as Q-in-Q). VLAN stacking includes two VLAN tags—an outer tag to identify the destination MSAN and an inner tag to identify the subscriber. For downstream traffic (that is, from the broadband services router or Ethernet switch to the MSAN), the outer tag determines which port to forward traffic. The forwarding device then uses the VLAN pop function on this tag before forwarding the traffic with a single tag. The reverse process occurs for upstream traffic.

VLAN stacking is not necessary for S-VLANs or M-VLANs. However, for the hybrid (C-VLAN and M-VLAN) model, the Ethernet switch or services router must be able to pop or push tags onto C-VLAN traffic while not modifying M-VLAN packets.

VLANs and Residential Gateways

One function provided by a residential gateway is to enable each subscriber to have a private (in-home) network, unseen by other broadband subscribers, while enabling the subscriber to have multiple devices connected to the broadband network. This private network is made possible by using Network Address Translation (NAT).

Most conditional access systems (for example, video on demand) require detecting the real IP address of the set-top box (STB). This security measure means that traffic to and from the STB must be bridged, not routed, across all network elements including aggregation switches, MSANs, and residential gateways. NAT cannot be used at the residential gateway for traffic to and from the STB. In addition, some residential gateways associate VLANs (or ATM virtual circuits) with ports. Traffic on a given VLAN is always forwarded to specific downstream port. Use caution when mapping VLANs on an MSAN.

Related Documentation

- Static Subscriber Interfaces and VLAN Overview in the [Junos OS Subscriber Access Configuration Guide](#).

AAA Service Framework and Broadband Subscriber Management Overview

You use AAA Service Framework for all authentication, authorization, accounting, address assignment, and dynamic request services that the services router uses for network access. The framework supports authentication and authorization through external servers, such as RADIUS. The framework also supports accounting and dynamic-request CoA and disconnect operations through external servers, and address assignment through a combination of local address-assignment pools and RADIUS.



NOTE: The broadband subscriber management solution currently supports the use of only RADIUS servers.

The broadband services router interacts with external servers to determine how individual subscribers access the broadband network. The router also obtains information from external servers for the following:

- Methods used for authentication and accounting.
- How accounting statistics are collected and used.
- How dynamic requests are handled.

Related Documentation

- AAA Service Framework Overview in the [Junos OS Subscriber Access Configuration Guide](#).
- RADIUS-Initiated Change of Authorization (CoA) Overview in the [Junos OS Subscriber Access Configuration Guide](#).

- RADIUS-Initiated Disconnect Overview in the *Junos OS Subscriber Access Configuration Guide*.

CHAPTER 4

Broadband Subscriber Management PPPoE Wholesale Overview

- [Layer 2 and Layer 3 Wholesale Overview on page 19](#)
- [PPPoE Layer 3 Wholesale Configuration Interface Support on page 20](#)
- [Subscriber to Logical System and Routing Instance Relationship on page 20](#)
- [RADIUS VSAs and Broadband Subscriber Management Wholesale Configuration Overview on page 21](#)

Layer 2 and Layer 3 Wholesale Overview

In general, wholesaling broadband services allows service providers to resell broadband services and allows other providers to deploy their own services over the incumbent network. There are different methods to partitioning an access network for resale. The two most common approaches are based on either Layer 2 or Layer 3 information. Wholesale access is the process by which the access network provider (the *wholesaler*) partitions the access network into separately manageable and accountable subscriber segments for resale to other network providers (or *retailers*).

In a Layer 3 wholesale configuration, you partition the wholesaler access network at the network layer or the subscriber IP component by associating the IP component with a distinct Layer 3 domain. In a Layer 2 wholesale configuration, you partition the access network at the subscriber circuit or customer VLAN (C-VLAN) by backhauling the connection through the service provider backbone network to the subscribing retailer network where the access traffic can be managed at higher layers.

In a Junos OS Dynamic Host Configuration Protocol (DHCP) or Point-to-Point Protocol over Ethernet (PPPoE) subscriber access configuration, wholesale partitioning is accomplished through the use of logical systems and routing instances within the router. Logical systems offer a stricter partitioning of routing resources than routing instances. The purpose behind the use of logical systems is to distinctly partition the physical router into separate administrative domains. This partitioning enables multiple providers to administer the router simultaneously, with each provider having access only to the portions of the configuration relevant to their logical system. Junos OS supports up to 15 named logical systems in addition to the default logical system (that is, **inet.0**). Unless otherwise specified in configuration, all interfaces belong to the default logical system.



NOTE: This Junos OS release supports the use of only the default logical system. Partitioning currently occurs through the use of separate routing instances.

A logical system can have one or more routing instances. Typically used in Layer 3 VPN scenarios, a routing instance does not have the same level of administrative separation as a logical system because it does not offer administrative isolation. However, the routing instance defines a distinct routing table, set of routing policies, and set of interfaces.

Related Documentation

- Broadband Subscriber Management DHCPv4 Layer 3 Wholesale Topology and Configuration Elements
- [Broadband Subscriber Management PPPoE Layer 3 Wholesale Topology and Configuration Elements on page 25](#)
- Broadband Subscriber Management Layer 2 Wholesale Topology and Configuration Elements

PPPoE Layer 3 Wholesale Configuration Interface Support

PPPoE Layer 3 wholesale requires the use of PPP interfaces. This means that you must specify the PP0 interface when configuring Layer 3 wholesaling in a PPPoE network.

For general additional information about configuring PPPoE interfaces, see the [Junos OS Network Interfaces Configuration Guide](#).

Related Documentation

- [Junos OS Network Interfaces Configuration Guide](#)
- Configuring a Basic PPPoE Dynamic Profile in the [Junos OS Subscriber Access Configuration Guide](#).
- Configuring Dynamic PPPoE Subscriber Interfaces Using Dynamic Profiles in the [Junos OS Subscriber Access Configuration Guide](#).
- Configuring a PPPoE Dynamic Profile with Additional Options in the [Junos OS Subscriber Access Configuration Guide](#).

Subscriber to Logical System and Routing Instance Relationship

As subscriber sessions are established, subscriber to logical system/routing instance memberships are established by the AAA framework configured for the default logical system. When configuring Layer 3 wholesaling, you typically configure global (wholesale) information within the default (master) logical system and default routing instance. Incoming subscribers must then be authenticated, but this authentication can be handled in one of two ways:

- Single (wholesaler only) authentication—Incoming subscribers are authenticated by the wholesaler RADIUS server. After authentication, the subscribers are assigned values

specified by dynamic profiles (routing instances, interfaces, and any configuration values) specific to a particular retailer.

- Dual (wholesaler and retailer) authentication—Sometimes referred to as *double-dip authentication*. Incoming subscribers are initially authenticated by RADIUS using the wholesale configuration. Authenticated subscribers are then redirected to other routing instances associated with individual retailer network space. When you redirect subscribers, and those subscribers are to be authenticated by AAA servers owned by individual retailers, the subscribers must be authenticated again by the AAA servers before they are provided an address and any dynamic profile values are assigned. After reauthentication, however, the subscribers are managed normally using any values specific to the retailer routing instance to which they are assigned.

**Related
Documentation**

- See Routing Instances Overview in the [Junos OS Routing Protocols Configuration Guide](#).

RADIUS VSAs and Broadband Subscriber Management Wholesale Configuration Overview

You can use RADIUS to assign various values through the use of dynamic variables within dynamic profiles. However, the configuration of at least one of the two VSAs described in [Table 4 on page 21](#) is required for a wholesale network to function.

Table 4: Required Juniper Networks VSAs for the Broadband Subscriber Management Wholesale Network Solution

Attribute Number	Attribute Name	Description	Value
26-1	LSRI-Name	Client logical system/routing instance membership name. Allowed only from RADIUS server for "default" logical system/routing instance membership.	string: logical system:routing instance
26-25	Redirect-LSRI-Name	Client logical system/routing instance membership name indicating to which logical system/routing instance membership the request is redirected for user authentication.	string: logical system:routing instance

Specifying the **\$junos-routing-instance** dynamic variable in a dynamic profile triggers a RADIUS access-accept response of either the LSRI-Name VSA or the Redirect-LSRI-Name VSA. Returning an LSRI-Name attribute in the access-accept response provides the logical system and routing instance in which the logical interface is to be created and the router updates the session database with the specified routing instance value.

Returning a Redirect-LSRI-Name attribute in the access-accept response results in the router immediately sending a second access-request message (sometimes referred to as a *double-dip*) to the RADIUS server specified by the logical system:routing instance attribute specified by the Redirect-LSRI-Name VSA.



NOTE: Attributes returned as a result of a second access-request message to the logical system/routing instance membership specified by the Redirect-LSRI-Name VSA override any prior attributes returned by initial access-accept responses to the default logical system/routing instance membership.

**Related
Documentation**

- Juniper Networks VSAs Supported by the AAA Service Framework in the [Junos OS Subscriber Access Configuration Guide](#).

PART 2

Configuration

- Broadband Subscriber Management PPPoE Layer 3 Wholesale Network Configuration on page 25
- Broadband Subscriber Management DHCP Layer 3 Wholesale Network Configuration Examples on page 35

CHAPTER 5

Broadband Subscriber Management PPPoE Layer 3 Wholesale Network Configuration

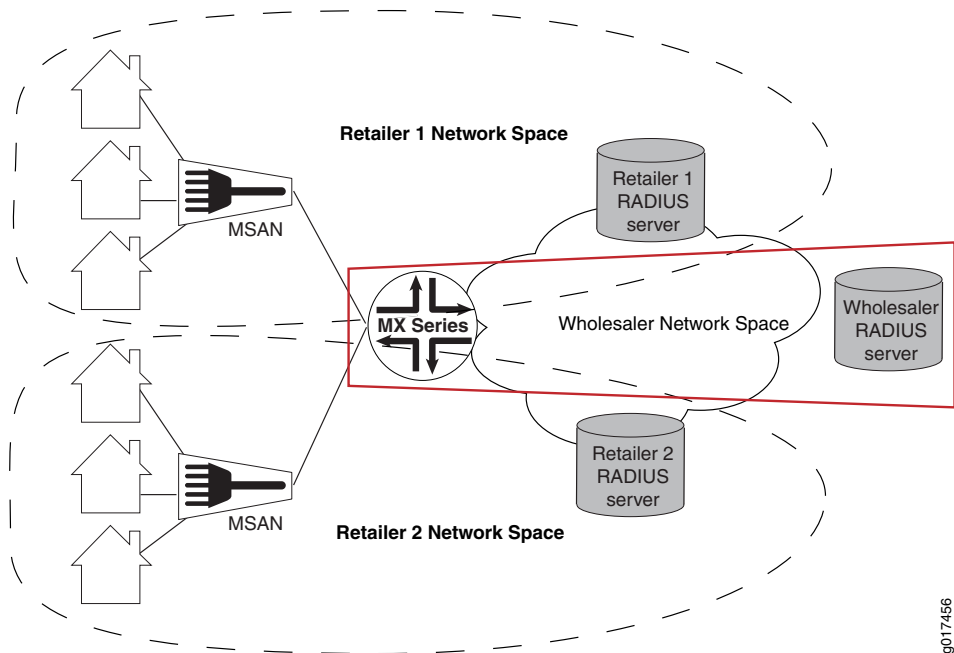
- [Broadband Subscriber Management PPPoE Layer 3 Wholesale Topology and Configuration Elements on page 25](#)
- [PPPoE Layer 3 Wholesale Network Topology Overview on page 26](#)
- [Configuring Loopback Interfaces for the PPPoE Layer 3 Wholesale Solution on page 27](#)
- [Configuring Static Customer VLANs for the PPPoE Layer 3 Wholesale Network Solution on page 28](#)
- [Configuring Access Components for the PPPoE Wholesale Network Solution on page 29](#)
- [Configuring Dynamic Profiles for the PPPoE Layer 3 Wholesale Network Solution on page 31](#)
- [Configuring Separate Routing Instances for PPPoE Service Retailers on page 33](#)

Broadband Subscriber Management PPPoE Layer 3 Wholesale Topology and Configuration Elements

The network topology for the subscriber management PPPoE Layer 3 wholesale solution includes configuring separate routing instances for individual retailers that use a portion of the router.

To explain the concept, but to limit complexity, this solution provides a configuration with one wholesaler and only two retailers. [Figure 2 on page 26](#) illustrates a basic PPPoE Layer 3 wholesale topology model from which you can expand.

Figure 2: Basic Subscriber Management PPPoE Layer 3 Wholesale Solution Topology



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When you are configuring a PPPoE Layer 3 wholesale network solution, the following configuration elements are required:

- Subscriber network VLAN configuration
- Addressing server or addressing server access configuration
- RADIUS server access configuration
- Dynamic profile configuration for default (wholesaler) access
- Routing instance configuration for individual retailers
- Group configuration and forwarding options for the network
- Core network configuration

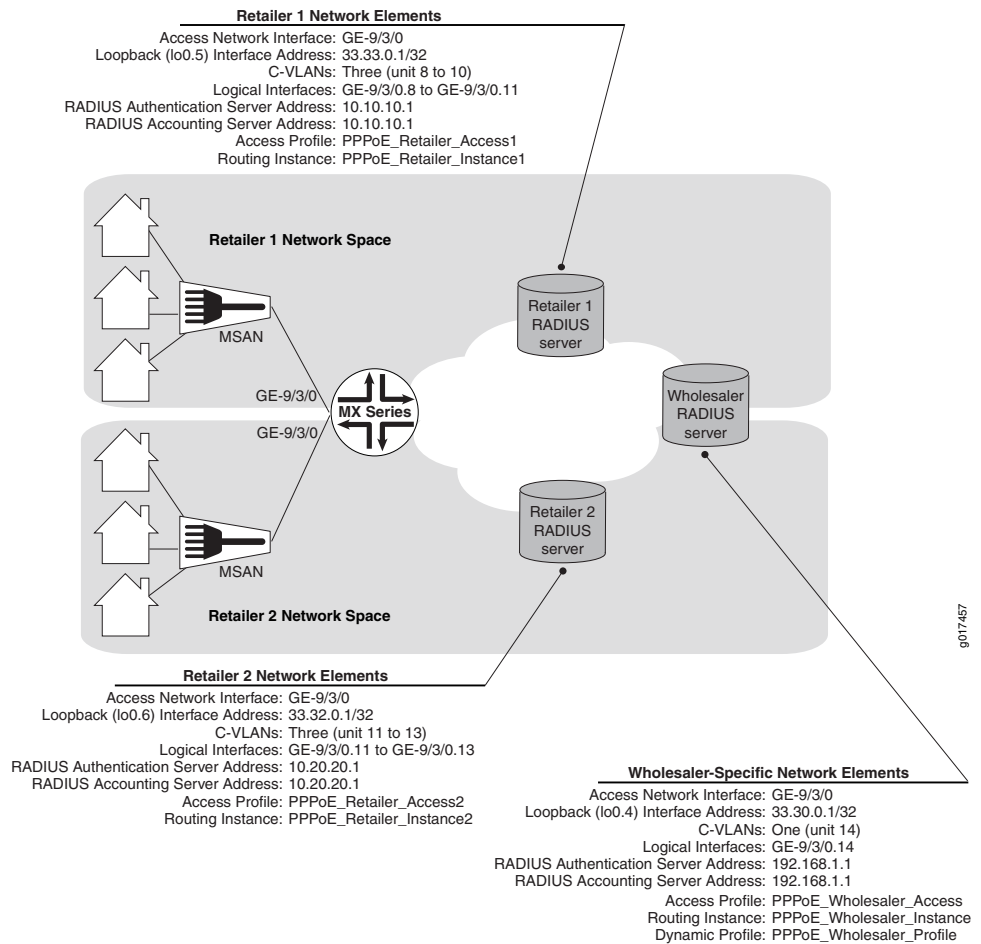
This implementation of PPPoE Layer 3 wholesale supports the following:

- Dynamic PPPoE interface creation.
- Static VLAN use only.
- AAA server assignment of subscribers to different routing instances within the same (default) logical system only.

PPPoE Layer 3 Wholesale Network Topology Overview

This configuration explains how to configure a simple PPPoE Layer 3 wholesale subscriber access network. This solution incorporates two retailers sharing resources on a wholesaler router. [Figure 3 on page 27](#) provides the reference topology for this configuration example.

Figure 3: PPPoE Layer 3 Wholesale Network Reference Topology



Related Documentation

- [Layer 2 and Layer 3 Wholesale Overview on page 19](#)
- [Broadband Subscriber Management DHCPv4 Layer 3 Wholesale Topology and Configuration Elements](#)

Configuring Loopback Interfaces for the PPPoE Layer 3 Wholesale Solution

You must configure loopback interfaces for use in the subscriber management access network. The loopback interfaces are automatically used for unnumbered interfaces.



NOTE: If you do not configure the loopback interface, the routing platform chooses the first interface to come online as the default. If you configure more than one address on the loopback interface, we recommend that you configure one to be the primary address to ensure that it is selected for use with unnumbered interfaces. By default, the primary address is used as the source address when packets originate from the interface.

To configure loopback interfaces:

1. Edit the loopback interface.

```
[edit]
user@host# edit interfaces lo0
```

2. Edit the unit for the wholesale loopback interface.

```
[edit interfaces lo0]
user@host# edit unit 4
```

3. Edit the wholesale loopback interface family.

```
[edit interfaces lo0 unit 4]
user@host# edit family inet
```

4. Specify the wholesale loopback interface address.

```
[edit interfaces lo0 unit 4 family inet]
user@host# set address 33.30.0.1/32
```

5. (Optional) Specify the loopback interface address as the primary loopback interface.

```
[edit interfaces lo0 unit 4 family inet]
user@host# set address 33.30.0.2/32 primary
```

6. Edit the unit for a retail loopback interface.

```
[edit interfaces lo0]
user@host# edit unit 5
```

7. Edit the retail loopback interface family.

```
[edit interfaces lo0 unit 5]
user@host# edit family inet
```

8. Specify the retail loopback interface address.

```
[edit interfaces lo0 unit 5 family inet]
user@host# set address 33.33.0.1/32
```

9. (Optional) Specify the loopback interface address as the primary loopback interface.

```
[edit interfaces lo0 unit 5 family inet]
user@host# set address 33.33.0.2/32 primary
```

10. Repeat steps 7 through 10 for additional retailers, making sure to use unique unit and address values for each retailer loopback interface.

**Related
Documentation**

- [Configuring Top-Level Broadband Subscriber Management Elements](#)
- [Junos OS Network Interfaces Configuration Guide](#)

Configuring Static Customer VLANs for the PPPoE Layer 3 Wholesale Network Solution

In this example configuration, the access interface (**ge-9/3/0**) connects to a device (that is, a DSLAM) on the access side of the network. You can define static customer VLANs (C-VLANs) for use by the wholesaler and any access network subscribers.

To configure the customer VLANs:

1. Edit the access side interface.

```
[edit]
user@host# edit interfaces ge-9/3/0
```

2. Specify the use of flexible VLAN tagging.

```
[edit interfaces ge-9/3/0]
user@host# set flexible-vlan-tagging
```

3. Edit the interface unit for the wholesaler VLAN.

```
[edit interfaces ge-9/3/0]
user@host# edit unit 14
```

4. Specify the type of encapsulation that you want the wholesaler VLAN to use.

```
[edit interfaces ge-9/3/0 unit 14]
user@host# set encapsulation ppp-over-ether
```

5. (Optional) Specify that you want the wholesaler VLAN to use Proxy ARP.

```
[edit interfaces ge-9/3/0 unit 14]
user@host# set proxy-arp
```

6. Define a unique VLAN ID for the wholesaler VLAN.

```
[edit interfaces ge-9/3/0 unit 14]
user@host# set vlan-id 14
```

7. Specify the dynamic profile that you want the wholesaler VLAN to use.

```
[edit interfaces ge-9/3/0 unit 14]
user@host# set pppoe-underlying-options dynamic-profile PPPoE_Wholesaler_Profile
```

Configuring Access Components for the PPPoE Wholesale Network Solution

When configuring a wholesale network, you must configure several components globally. This configuration provides access to RADIUS servers (if used) that you want the wholesaler and any configured retailers to use globally. The access configuration includes the following general steps:

- [Configuring RADIUS Server Access on page 29](#)
- [Configuring a PPPoE Wholesaler Access Profile on page 30](#)
- [Configuring PPPoE Retailer Access Profiles on page 30](#)

Configuring RADIUS Server Access

You can globally define any RADIUS servers in your network that either the wholesale access profile or retailer access profile can use. After you define the global RADIUS servers, you can specify specific RADIUS servers within individual access profiles.

To define RADIUS servers for profile access:

1. Access the **[edit access radius-server]** hierarchy level.

```
[edit ]
```

```
user@host# edit access radius-server
```

2. Specify the address and secret for any RADIUS servers in the network.

```
[edit access radius-server]
user@host# set 192.168.10.1 secret $9$CzBxBBf1eWx-wM8xgaU.m345B02EcyKXL
user@host# set 10.10.10.1 secret $7$OsCsBAf1fXx-wY3xgaU.m123A02ZtyNMT
```

Configuring a PPPoE Wholesaler Access Profile

You must define the network and interface over which you want subscribers to initially access the network with a wholesale access profile. When a subscriber attempts to access the network, the access profile provides initial access information including authentication and accounting values that the router uses for the accessing subscriber.

To define a wholesale access profile:

1. Create the wholesale access profile.

```
[edit]
user@host# edit access profile PPPoE_Wholesaler_Access
```

2. Specify the authentication methods for the profile and the order in which they are used.

```
[edit access profile PPPoE_Wholesaler_Access]
user@host# set authentication-order radius
```

3. Specify that you want to configure RADIUS support.

```
[edit access profile PPPoE_Wholesaler_Access]
user@host# edit radius
```

4. Specify the IP address of the RADIUS server used for authentication.

```
[edit access profile PPPoE_Wholesaler_Access radius]
user@host# set authentication-server 192.168.10.1
```

5. Specify the IP address of the RADIUS server used for accounting.

```
[edit access profile PPPoE_Wholesaler_Access radius]
user@host# set accounting-server 192.168.10.1
```

6. Configure any desired options for the RADIUS server.

See [Configuring RADIUS Server Options for Subscriber Access](#).

7. Configure subscriber accounting (RADIUS accounting).

See [Configuring Per-Subscriber Session Accounting](#).

Configuring PPPoE Retailer Access Profiles

In this solution, subscribers are redirected to a networking space used by a specific retailer and defined by a unique routing instance. This method requires that you define the network and interface over which you want subscribers to access the network after being redirected by the wholesale access profile.

To define a retailer access profile:

1. Create the retailer access profile.

```
[edit]
user@host# edit access profile PPPoE_Retailer_Access1
```

2. Specify the authentication methods for the profile and the order in which they are used.

```
[edit access profile PPPoE_Retailer_Access1]
user@host# set authentication-order radius
```

3. Specify that you want to configure RADIUS support.

```
[edit access profile PPPoE_Retailer_Access1]
user@host# edit radius
```

4. Specify the IP address of the RADIUS server used for authentication.

```
[edit access profile PPPoE_Retailer_Access1 radius]
user@host# set authentication-server 10.10.10.1
```

5. Specify the IP address of the RADIUS server used for accounting.

```
[edit access profile PPPoE_Retailer_Access1 radius]
user@host# set accounting-server 10.10.10.1
```

6. Configure any desired options for the RADIUS server.

See [Configuring RADIUS Server Options for Subscriber Access](#).

7. Configure subscriber accounting (RADIUS accounting).

See [Configuring Per-Subscriber Session Accounting](#).

Configuring Dynamic Profiles for the PPPoE Layer 3 Wholesale Network Solution

A dynamic profile is a set of characteristics, defined in a type of template, that you can use to provide services for broadband applications. These services are assigned dynamically to interfaces as they access the network. When configuring dynamic profiles for the PPPoE Layer 3 wholesale network, you can choose to configure one dynamic profile to address all incoming subscribers or you can configure individual dynamic profiles for use by the different network management groups (that is, the wholesaler and any retailers). In fact, you can create multiple dynamic profiles that you can use to roll out different services and selectively apply those dynamic profiles to different subscriber groups as necessary.

In this solution example, one dynamic profile is created for use by the wholesaler when subscribers initially access the network. Subscribers are assigned by the wholesaler RADIUS server to a particular retailer routing instance and can then be redirected to that retailer network space.

- [Configuring a Wholesale Dynamic Profile for use in the PPPoE Solution on page 32](#)

Configuring a Wholesale Dynamic Profile for use in the PPPoE Solution

You can configure a basic access profile to initially manage PPPoE subscribers that access the network.

To configure a dynamic profile for use by the wholesaler:

1. Create a wholesale dynamic profile.

```
[edit]
user@host# edit dynamic-profiles PPPoE_Wholesaler_Profile
```

2. Define the dynamic routing instance variable in the dynamic profile.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile]
user@host# edit routing-instances $junos-routing-instance
```

3. Set the dynamic interface variable for the dynamic routing instance.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile routing-instances
"$junos-routing-instance"]
user@host# set interface $junos-interface-name
```

4. Specify that you want to configure the **pp0** interface in the dynamic profile.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile]
user@host# edit interfaces pp0
```

5. Configure the unit for the **pp0** interface.

- a. Configure the variable for the unit number of the **pp0** interface.

The variable is dynamically replaced with the unit number that RADIUS supplies when the subscriber logs in.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0]
user@host# edit unit $junos-interface-unit
```

- b. Configure PAP or CHAP (or both) to function on the interface.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0 unit
"$junos-interface-unit"]
user@host# set ppp-options chap pap
```

- c. Configure the variable for the underlying interface of the pp0 interfaces.

The variable is dynamically replaced with the underlying interface that RADIUS supplies when the subscriber logs in.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0 unit
"$junos-interface-unit"]
user@host# set pppoe-options underlying-interface $junos-underlying-interface
```

- d. Configure the router to act as a PPPoE server.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0 unit
"$junos-interface-unit"]
user@host# set pppoe-options server
```

6. (Optional) Modify the PPPoE keepalive interval.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0 unit
"$junos-interface-unit"]
user@host# set keepalives interval 15
```

7. Configure the family for the **pp0** interface.
 - a. Specify that you want to configure the family.



NOTE: You can specify **inet** for IPv4 and **inet6** for IPv6. However, this solution provides the IPv4 configuration only.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0 unit
"$junos-interface-unit"]
user@host# edit family inet
```

- b. Configure the unnumbered address for the family.

```
[edit dynamic-profiles PPPoE_Wholesaler_Profile interfaces pp0 unit
"$junos-interface-unit" family inet]
user@host# set unnumbered-address $junos-loopback-interface
```

Configuring Separate Routing Instances for PPPoE Service Retailers

As the owner of the system, the wholesaler uses the default routing instance. You must create separate routing instances for each individual retailer to keep routing information for individual retailers separate and to define any servers and forwarding options specific to each retailer.

To define a retailer routing instance:

1. Create the retailer routing instance.

```
[edit]
user@host# edit routing-instances PPPoE_Retailer_Instance1
```

2. Specify the routing instance type for the retailer.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set instance-type vrf
```

3. Specify the access profile that you want the routing instance to use.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set access-profile PPPoE_Retailer_Access1
```

4. Specify the interface that faces the Retailer1 RADIUS server.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set interface ge-11/1/9.10
```

5. Specify the loopback interface unit for this routing instance.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set interface lo0.5
```



NOTE: Loopback interfaces must be unique for each routing instance.

6. Specify an identifier to distinguish the VPN to which the route belongs.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set route-distinguisher 1:1
```

7. Specify how routes are imported into the local PE router's VPN routing table from the remote PE router.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set vrf-import policyImport
```

8. Specify which routes are exported from the local instance table to the remote PE router.

```
[edit routing-instances "PPPoE_Retailer_Instance1"]
user@host# set vrf-export policyExport
```

9. Repeat this procedure for other retailers.

**Related
Documentation**

- [Configuring Routing Instances](#)

Broadband Subscriber Management DHCP Layer 3 Wholesale Network Configuration Examples

- [Example: Wholesaler Dynamic Profile for a PPPoE Wholesale Network on page 35](#)
- [Example: Retailer Routing Instances for a PPPoE Wholesale Network on page 36](#)

Example: Wholesaler Dynamic Profile for a PPPoE Wholesale Network

This example specifies a dynamic profile name of *PPPoE_Wholesaler_Profile*, uses pp0 interfaces, and references the predefined input firewall filter.

```
PPPoE_Wholesaler_Profile {
  routing-instances {
    "$junos-routing-instance" {
      interface "$junos-interface-name";
    }
  }
  interfaces {
    pp0 {
      unit "$junos-interface-unit" {
        ppp-options {
          chap;
          pap;
        }
        pppoe-options {
          underlying-interface "$junos-underlying-interface";
          server;
        }
        keepalives interval 15;
        family inet {
          filter {
            input "$junos-input-filter";
            output "$junos-output-filter";
          }
          unnumbered-address "$junos-loopback-interface";
        }
      }
    }
  }
}
```

```
}
```

Example: Retailer Routing Instances for a PPPoE Wholesale Network

```
routing-instances {  
  PPPoE_Retailer_Instance1 {  
    instance-type vrf;  
    access-profile PPPoE_Retailer_Access1;  
    interface ge-11/1/9.10;  
    interface lo0.5;  
    route-distinguisher 1:1;  
    vrf-import policyImport;  
    vrf-export policyExport;  
  }  
  Retailer_Instance2 {  
    instance-type vrf;  
    access-profile PPPoE_Retailer_Access2;  
    interface ge-11/1/9.10;  
    interface lo0.6;  
    route-distinguisher 2:2;  
    vrf-import policyImport;  
    vrf-export policyExport;  
  }  
}
```

PART 3

Administration

- [Subscriber Management AAA and PPPoE CLI Commands on page 39](#)
- [Subscriber Management Interface CLI Commands on page 47](#)
- [Subscriber Management Subscriber CLI Commands on page 83](#)

CHAPTER 7

Subscriber Management AAA and PPPoE CLI Commands

show network-access aaa statistics

Syntax	<pre>show network-access aaa statistics <accounting> <address-assignment (client pool <i>pool-name</i>)> <dynamic-requests> <radius></pre>
Release Information	<p>Command introduced in Junos OS Release 9.1.</p> <p>Option address-assignment introduced in Junos OS Release 10.0.</p> <p>Option radius introduced in Junos OS Release 11.4.</p>
Description	Display AAA accounting, address-assignment, dynamic request statistics, and RADIUS settings and statistics.
Options	<p>accounting—(Optional) Display AAA accounting statistics.</p> <p>address-assignment (client pool <i>pool-name</i>)—(Optional) Display AAA address-assignment client and pool statistics.</p> <p>dynamic-requests—(Optional) Display AAA dynamic requests.</p> <p>radius— (Optional) Display RADIUS settings and statistics.</p>
Required Privilege Level	view
List of Sample Output	<p>show network-access aaa statistics accounting on page 42</p> <p>show network-access aaa statistics address-assignment client on page 42</p> <p>show network-access aaa statistics address-assignment pool on page 42</p> <p>show network-access aaa statistics dynamic-requests on page 42</p> <p>show network-access aaa statistics radius on page 42</p>
Output Fields	Table 5 on page 40 lists the output fields for the show network-access aaa statistics command. Output fields are listed in the approximate order in which they appear.

Table 5: show network-access aaa statistics Output Fields

Field Name	Field Description
Requests received	<ul style="list-style-type: none"> Number of accounting requests generated by the AAA framework. Number of dynamic requests received from the external server.
Accounting Response failures	Number of accounting requests not acknowledged (NAK) by the accounting server.
Accounting Response Success	Number of accounting requests acknowledged by the accounting server.
Requests timedout	Number of accounting requests to the accounting server that timed out.
Client	Client type; for example, DHCP, Mobile IP, PPP.

Table 5: show network-access aaa statistics Output Fields (*continued*)

Field Name	Field Description
Out of Memory	Number of times an address was not given to the client due to memory issues.
No Matches	Number of times there were no network matches for the pool.
Pool Name	Name of the address-assignment pool for this client.
Out of Addresses	Number of times there were no available addresses in the pool.
Address total	Number of addresses in the pool.
Addresses in use	Number of addresses in use.
Address Usage (percent)	Percentage of total addresses in use.
processed successfully	Number of dynamic requests processed successfully by the AAA framework.
errors during processing	Number of dynamic requests that resulted in processing errors by the AAA framework.
Link Name	Name of the secondary address-assignment pool to which the primary pool is linked.
Pool Usage	Percentage of allocated addresses in the specified address pool.
silently dropped	Number of dynamic requests dropped by the AAA framework due to multiple back-to-back or duplicate requests.
RADIUS Server	IP address of the RADIUS server to which the router is sending requests.
Profile	Name of the RADIUS profile associated with the RADIUS server. A RADIUS server can be associated with more than one RADIUS profile.
Configured	Configured maximum number of outstanding requests from the router to the RADIUS server for a specific profile. An outstanding request is a request to which the RADIUS server has not yet responded. The range of values is 0 through 2000 outstanding requests. The default value is 1000.
Current	Current number of outstanding requests from the router to the RADIUS server for a specific profile. An outstanding request is a request to which the RADIUS server has not yet responded.
Peak	Highest number of outstanding requests from the router to the RADIUS server for a specific profile at any point in time since the router was started or since the counter was last cleared. NOTE: If the value of this field is equal to the value of the Configured field, you may want to increase the value of the Configured field.
Exceeded	Number of times that the router attempted to send requests to the RADIUS server in excess of the configured maximum value for a specific profile. NOTE: If the value of this field is nonzero, you may want to increase the value of the Configured field.

Sample Output

```
show network-access user@host> show network-access aaa statistics accounting
aaa statistics      Accounting module statistics
                    Requests received: 0
                    Accounting Response failures: 0
                    Accounting Response Success: 0
                    Requests timedout: 0

show network-access user@host> show network-access aaa statistics address-assignment client
aaa statistics      Address-assignment statistics
address-assignment Client: jdhcpd
client              Out of Memory: 0
                    No Matches: 2

show network-access user@host> show network-access aaa statistics address-assignment pool isp_1
aaa statistics      Address-assignment statistics
address-assignment Pool Name: isp_1
pool                Pool Name: (all pools in chain)
                    Out of Memory: 0
                    Out of Addresses: 9
                    Address total: 47
                    Addresses in use: 47
                    Address Usage (percent): 100

show network-access user@host> show network-access aaa statistics dynamic-requests
aaa statistics      requests received: 0
dynamic-requests    processed successfully: 0
                    errors during processing: 0
                    silently dropped: 0

show network-access user@host> show network-access aaa statistics radius
aaa statistics radius Outstanding Requests
RADIUS Server      Profile      Configured   Current   Peak   Exceeded
172.28.32.239      prof1        1000         0         1000   14
                   prof2        500          17         432    0
171.27.82.211      myprof       200          0         200    27
12.1.11.254        pppoe-auth   111          0          1       0
```


show network-access aaa subscribers

Syntax	<code>show network-access aaa subscribers</code> <code><logical-system <i>logical-system-name</i>></code> <code><routing-instance <i>routing-instance-name</i>></code> <code><statistics></code> <code><username></code>
Release Information	Command introduced in Junos OS Release 9.1.
Description	Display subscriber-specific AAA statistics.
Options	<p><code>logical-system <i>logical-system-name</i></code>—(Optional) List subscribers in the specific logical system.</p> <p><code>routing-instance <i>routing-instance-name</i></code>—(Optional) List subscribers for the specific routing instance. If you do not specify a routing instance name, the default routing instance is assumed.</p> <p><code>statistics</code>—(Optional) Display statistics for the subscriber events.</p> <p><code>username</code>—(Optional) Display information for the specified subscriber.</p>
Required Privilege Level	view
List of Sample Output	show network-access aaa subscribers logical-system on page 44 show network-access aaa subscribers logical-system routing-instance on page 44 show network-access aaa subscribers statistics username on page 44 show network-access aaa subscribers username on page 45
Output Fields	Table 6 on page 43 lists the output fields for the show network-access aaa subscribers command. Output fields are listed in the approximate order in which they appear.

Table 6: show network-access aaa subscribers Output Fields

Field Name	Field Description
Challenge requests	Number of authentication requests challenged by the authentication server for this subscriber.
Challenge responses	Number of challenge responses sent by the subscriber to the authentication server.
START sent successfully	Number of accounting start requests generated by the AAA framework for this subscriber.
START send failures	Number of accounting start requests that failed to make it to the accounting server for this subscriber.
START ack received	Number of accounting start requests acknowledged by the accounting server for this subscriber.
INTERIM sent successfully	Number of accounting interim requests generated by the AAA framework for this subscriber.

Table 6: show network-access aaa subscribers Output Fields (*continued*)

Field Name	Field Description
INTERIM send failures	Number of accounting interim requests that failed to make it to the accounting server for this subscriber.
INTERIM ack received	Number of accounting interim requests acknowledged by the accounting server for this subscriber.
Requests received	Number of reauthentication requests received by the authentication server.
Successful responses	Number of successful reauthentication requests granted by the authentication server.
Aborts handled	Number of reauthentication requests aborted by the authentication server.
Service name	Name of the subscriber service.
Creation requests	Number of requests to create the service.
Deletion requests	Number of requests to delete the service.
Request timeouts	Number of times the service request was timed out.
Client type	Type of client; for example, DHCP, Mobile IP, PPP.
Session-ID	ID of the subscriber session.
Session uptime	How long the session has been up, in <i>HH:MM:SS</i> .
Accounting	Status of accounting, and type of accounting if accounting is on.

Sample Output

```

show network-access aaa subscribers logical-system
user@host> show network-access aaa subscribers logical-system
Username      Client type  Logical system/Routing instance
cbenson@addr.net  ppp         default
00010e020304.1231 dhcp         isp-bos-metro-12:isp-cmbrg-12
conley@isp3.com  dhcp         default:isp-gtown-r3-00
0020df980102.2334 dhcp         isp-bos-metro-16:isp-cmbrg-12

show network-access aaa subscribers logical-system routing-instance
user@host> show network-access aaa subscribers logical-system routing-instance isp-bos-metro-16
routing-instance isp-cmbrg-12-32
Username      Client type  Logical system/Routing instance
00010e020304.1231 dhcp         isp-bos-metro-12:isp-cmbrg-12
conley@isp3.com  dhcp         default:isp-gtown-r3-00
0020df980102.2334 dhcp         isp-bos-metro-16:isp-cmbrg-12

show network-access aaa subscribers statistics username 00010e020304.1231
user@host> show network-access aaa subscribers statistics username 00010e020304.1231
Authentication statistics
  Challenge requests: 0
  Challenge responses: 0
Accounting statistics
  START sent successfully: 1
  START send failures: 0

```

```

START ack received: 1
INTERIM sent successfully: 0
INTERIM send failures: 0
INTERIM ack received: 0
Re-authentication statistics
Requests received: 0
Sucessfull responses: 0
Aborts handled: 0
Service statistics
Service name: filter-serv
Creation requests: 1
Deletion requests: 0
Request timeouts: 0
Service name: filter-serv2
Creation requests: 144
Deletion requests: 0
Request timeouts: 144

```

```

show network-access user@host> show network-access aaa subscribers username fred@isp5.net
aaa subscribers Logical system/Routing instance Client type Session-ID Session uptime
username Accounting
isp-bos-metro-16:isp-cmbrg-12 dhcp 7 01:12:56
on/volume
Service name Service type Quota Accounting
I-Cast volume 1200 Mbps on/volume+time
Voip on/volume
GamingBurst time 6000 secs on/volume

```

show network-access address-assignment pool

Syntax	<code>show network-access address-assignment pool <i>pool-name</i></code> <code><logical-system <i>logical-system-name</i>></code> <code><routing-instance <i>routing-instance-name</i>></code>
Release Information	Command introduced in Junos OS Release 9.0.
Description	Display state information for each address-assignment pool.
Options	<p>none—Display information about clients that have obtained addresses from the address-assignment pool.</p> <p>pool <i>pool-name</i>—Display information about the specified address-assignment pool.</p> <p>logical-system <i>logical-system-name</i>—(Optional) Perform this operation on the specified logical system.</p> <p>routing-instance <i>routing-instance-name</i>—(Optional) Perform this operation on the specified routing instance.</p>
Required Privilege Level	view and system
List of Sample Output	show network-access address-assignment pool on page 46
Output Fields	Table 7 on page 46 lists the output fields for the show address-assignment pool command. Output fields are listed in the approximate order in which they appear.

Table 7: show network-access address-assignment pool Output Fields

Field Name	Field Description
IP address	IP address of the client.
Hardware address	MAC address of the client.
Type	Type of client.

Sample Output

```

user@host> show network-access address-assignment pool sunnywest logical-system ls1
address-assignment routing-instance routinst2
pool
IP address      Hardware address  Type
192.168.2.1     00:05:1b:00:b9:01 DHCP
192.168.2.2     00:05:1b:00:b9:02 DHCP
192.168.2.3     00:05:1b:00:b9:03 DHCP
192.168.2.4     00:05:1b:00:b9:04 DHCP

```

CHAPTER 8

Subscriber Management Interface CLI Commands

show interfaces (Loopback)

Syntax `show interfaces lo0`
`<brief | detail | extensive | terse>`
`<descriptions>`
`<media>`
`<snmp-index snmp-index>`
`<statistics>`

Release Information Command introduced before Junos OS Release 7.4.

Description Display status information about the local loopback interface.



NOTE: Logical interface lo0.16385 is the loopback interface for the internal routing instance. Created by the internal routing service process, this interface facilitates internal traffic. It prevents any filter created on loopback lo0.0 from blocking internal traffic.

Options **lo0**—Display standard status information about the local loopback interface.

brief | detail | extensive | terse—(Optional) Display the specified level of output.

descriptions—(Optional) Display interface description strings.

media—(Optional) Display media-specific information.

snmp-index *snmp-index*—(Optional) Display information for the specified SNMP index of the interface.

statistics—(Optional) Display static interface statistics.

Required Privilege Level view

List of Sample Output [show interfaces \(Loopback\) on page 51](#)
[show interfaces brief \(Loopback\) on page 52](#)
[show interfaces detail \(Loopback\) on page 52](#)
[show interfaces extensive \(Loopback\) on page 53](#)

Output Fields [Table 8 on page 48](#) lists the output fields for the **show interfaces** (loopback) command. Output fields are listed in the approximate order in which they appear.

Table 8: Loopback show interfaces Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical Interface	Name of the physical interface.	All levels

Table 8: Loopback show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under Common Output Fields Description.	All levels
Interface index	Physical interface index number, which reflects its initialization sequence.	detail extensive none
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Type	Type of interface.	All levels
Link-level type	Encapsulation type used on the physical interface.	All levels
MTU	Size of the largest packet to be transmitted.	All levels
Clocking	Reference clock source of the interface.	All levels
Speed	Network speed on the interface.	All levels
Device flags	Information about the physical device. Possible values are described in the “Device Flags” section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the “Interface Flags” section under Common Output Fields Description.	All levels
Link type	Data transmission type.	detail extensive
Link flags	Information about the link. Possible values are described in the “Link Flags” section under Common Output Fields Description.	detail extensive none
Physical info	Information about the physical interface.	detail extensive
Hold-times	Current interface hold-time up and hold-time down. Value is in milliseconds.	detail extensive
Current address	Configured MAC address.	detail extensive
Hardware address	Media access control (MAC) address of the interface.	detail extensive
Alternate link address	Backup link address.	detail extensive
Last flapped	Date, time, and how long ago the interface went from down to up. The format is Last flapped: year-month-day hour:minute:second timezone (hour:minute:second ago) . For example, Last flapped: 2002-04-26 10:52:40 PDT (04:33:20 ago) .	detail extensive
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive

Table 8: Loopback show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes, Output bytes—Number of bytes received and transmitted on the interface. • Input packets, Output packets—Number of packets received and transmitted on the interface. 	detail extensive
Input errors	<ul style="list-style-type: none"> • Errors—Input errors on the interface. • Drops—Number of packets dropped by the output queue of the I/O Manager ASIC. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Runts—Frames received smaller than the runt threshold. • Giants—Frames received larger than the giant threshold. • Policed Discards—Frames that the incoming packet match code discarded because the frames were not recognized or were not of interest. Usually, this field reports protocols that Junos does not support. • Resource errors—Sum of transmit drops. 	extensive
Output errors	<ul style="list-style-type: none"> • Carrier transitions—Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly, possibly once every 10 seconds, the cable, the remote system, or the interface is malfunctioning. • Errors—Sum of outgoing frame aborts and FCS errors. • Drops—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet dropped by the ASIC RED mechanism. • MTU errors—Number of packets larger than the MTU threshold. • Resource errors—Sum of transmit drops. 	extensive
Logical Interface		
Logical interface	Name of the logical interface.	All levels
Index	Logical interface index number, which reflects its initialization sequence.	detail extensive
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Flags	Information about the logical interface; values are described in the “Logical Interface Flags” section under Common Output Fields Description.	brief detail extensive
Encapsulation	Encapsulation on the logical interface.	brief detail extensive
Input packets	Number of packets received on the logical interface.	None specified

Table 8: Loopback show interfaces Output Fields (*continued*)

Field Name	Field Description	Level of Output
Output packets	Number of packets transmitted on the logical interface.	None specified
Traffic statistics	Total number of bytes and packets received and transmitted on the logical interface. These statistics are the sum of the local and transit statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	detail extensive
Local statistics	Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. It takes awhile (generally, less than 1 second) for this counter to stabilize.	detail extensive
Protocol	Protocol family configured on the logical interface (such as iso or inet6).	detail extensive none
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route Table	Route table in which this address exists; for example, Route table:0 refers to inet.0.	detail extensive
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	detail extensive none
Addresses, Flags	Information about the address flags. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	detail extensive
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive

Sample Output

```

show interfaces user@host> show interfaces lo0
(Loopback) Physical interface: lo0, Enabled, Physical link is Up
              Interface index: 6, SNMP ifIndex: 6
              Type: Loopback, MTU: Unlimited
              Device flags   : Present Running Loopback
              Interface flags: SNMP-Traps
              Link flags     : None
              Last flapped   : Never
              Input packets  : 0
              Output packets : 0

              Logical interface lo0.0 (Index 64) (SNMP ifIndex 16)

```

```
Flags: SNMP-Traps Encapsulation: Unspecified
Input packets : 0
Output packets: 0
Protocol inet, MTU: Unlimited
  Flags: None
  Addresses, Flags: Is-Default Is-Primary
    Local: 10.0.0.1
  Addresses
    Local: 127.0.0.1
Protocol iso, MTU: Unlimited
  Flags: None
  Addresses, Flags: Is-Default Is-Primary
    Local: 49.0004.1000.0000.0001
```

```
Logical interface lo0.16385 (Index 65) (SNMP ifIndex 76)
Flags: SNMP-Traps Encapsulation: Unspecified
Input packets : 0
Output packets: 0
Protocol inet, MTU: Unlimited
  Flags: None
```

**show interfaces brief
(Loopback)**

```
user@host> show interfaces lo0 brief
Physical interface: lo0, Enabled, Physical link is Up
Type: Loopback, Link-level type: Unspecified, MTU: Unlimited,
Clocking: Unspecified, Speed: Unspecified
Device flags   : Present Running Loopback
Interface flags: SNMP-Traps
```

```
Logical interface lo0.0
Flags: SNMP-Traps Encapsulation: Unspecified
inet  10.0.0.1      --> 0/0
      127.0.0.1    --> 0/0
iso   49.0004.1000.0000.0001
```

```
Logical interface lo0.16385
Flags: SNMP-Traps Encapsulation: Unspecified
inet
```

**show interfaces detail
(Loopback)**

```
user@host> show interfaces lo0 detail
Physical interface: lo0, Enabled, Physical link is Up
Interface index: 6, SNMP ifIndex: 6, Generation: 4
Type: Loopback, Link-level type: Unspecified, MTU: Unlimited,
Clocking: Unspecified, Speed: Unspecified
Device flags   : Present Running Loopback
Interface flags: SNMP-Traps
Link type      : Unspecified
Link flags     : None
Physical info  : Unspecified
Hold-times     : Up 0 ms, Down 0 ms
Current address: Unspecified, Hardware address: Unspecified
Alternate link address: Unspecified
Last flapped   : Never
Statistics last cleared: Never
Traffic statistics:
Input bytes   : 0
Output bytes  : 0
Input packets : 0
Output packets: 0
Logical interface lo0.0 (Index 64) (SNMP ifIndex 16) (Generation 3)
Flags: SNMP-Traps Encapsulation: Unspecified
Traffic statistics:
```

```

Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0

Protocol inet, MTU: Unlimited, Generation: 10, Route table: 0
Flags: None
Addresses, Flags: Is-Default Is-Primary
Destination: Unspecified, Local: 10.0.0.1, Broadcast: Unspecified,
Generation: 10
Addresses, Flags: None
Destination: Unspecified, Local: 127.0.0.1, Broadcast: Unspecified,
Generation: 12
Protocol iso, MTU: Unlimited, Generation: 11, Route table: 0
Flags: None
Addresses, Flags: Is-Default Is-Primary
Destination: Unspecified, Local: 49.0004.1000.0000.0001,
Broadcast: Unspecified, Generation: 14

Logical interface lo0.16385 (Index 65) (SNMP ifIndex 76) (Generation 4)
Flags: SNMP-Traps Encapsulation: Unspecified
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Protocol inet, MTU: Unlimited, Generation: 12, Route table: 1
Flags: None

```

```

show interfaces extensive (Loopback) user@host> show interfaces lo0 extensive
Physical interface: lo0, Enabled, Physical link is Up
Interface index: 6, SNMP ifIndex: 6, Generation: 4
Type: Loopback, Link-level type: Unspecified, MTU: Unlimited,
Clocking: Unspecified, Speed: Unspecified
Device flags : Present Running Loopback
Interface flags: SNMP-Traps
Link type : Unspecified
Link flags : None
Physical info : Unspecified
Hold-times : Up 0 ms, Down 0 ms
Current address: Unspecified, Hardware address: Unspecified
Alternate link address: Unspecified
Last flapped : Never
Statistics last cleared: Never
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Input errors:

```

Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
Policed discards: 0, Resource errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, MTU errors: 0,
Resource errors: 0

Logical interface lo0.0 (Index 64) (SNMP ifIndex 16) (Generation 3)
Flags: SNMP-Traps Encapsulation: Unspecified
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Protocol inet, MTU: Unlimited, Generation: 10, Route table: 0
Flags: None
Addresses, Flags: Is-Default Is-Primary
Destination: Unspecified, Local: 10.0.0.1, Broadcast: Unspecified,
Generation: 10
Addresses, Flags: None
Destination: Unspecified, Local: 127.0.0.1, Broadcast: Unspecified,
Generation: 12
Protocol iso, MTU: Unlimited, Generation: 11, Route table: 0
Flags: None
Addresses, Flags: Is-Default Is-Primary
Destination: Unspecified, Local: 49.0004.1000.0000.0001,
Broadcast: Unspecified, Generation: 14

Logical interface lo0.16385 (Index 65) (SNMP ifIndex 76) (Generation 4)
Flags: SNMP-Traps Encapsulation: Unspecified
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Protocol inet, MTU: Unlimited, Generation: 12, Route table: 1
Flags: None

show interfaces filters

Syntax	show interfaces filters <interface-name>
Release Information	Command introduced before Junos OS Release 7.4. Command introduced on PTX Series Packet Transport Switches for Junos OS Release 12.1.
Description	Display all firewall filters that are installed on each interface in a system.
Options	none —Display filter information about all interfaces. interface-name —(Optional) Display filter information about a particular interface.
Additional Information	For information about how to configure firewall filters, see the Junos OS Policy Framework Configuration Guide . For related operational mode commands, see the Junos OS Routing Protocols and Policies Command Reference .
Required Privilege Level	view
List of Sample Output	show interfaces filters on page 56 show interfaces filters interface-name on page 56 show interfaces filters (PTX Series Packet Transport Switches) on page 56
Output Fields	Table 9 on page 55 lists the output fields for the show interfaces filters command. Output fields are listed in the approximate order in which they appear.

Table 9: show interfaces filters Output Fields

Field Name	Field Description
Interface	Name of the interface.
Admin	Interface state: up or down .
Link	Link state: up or down .
Proto	Protocol configured on the interface.
Input Filter	Names of any firewall filters to be evaluated when packets are received on the interface, including any filters attached through activation of dynamic service.
Output Filter	Names of any firewall filters to be evaluated when packets are transmitted on the interface, including any filters attached through activation of dynamic service.

Sample Output

```

show interfaces filters user@host> show interfaces filters
Interface      Admin Link Proto Input Filter      Output Filter
ge-0/0/0       up    up    inet
ge-0/0/0.0     up    up    inet
                                   iso
ge-5/0/0       up    up
ge-5/0/0.0     up    up    any
                                   inet
                                   multiservice
f-any
f-inet

gr-0/3/0       up    up
ip-0/3/0       up    up
mt-0/3/0       up    up
pd-0/3/0       up    up
pe-0/3/0       up    up
vt-0/3/0       up    up
at-1/0/0       up    up
at-1/0/0.0     up    up    inet
                                   iso
at-1/1/0       up    down
at-1/1/0.0     up    down inet
                                   iso
....

show interfaces filters user@host> show interfaces filters so-2/1/0
interface-name Interface      Admin Link Proto Input Filter      Output Filter
so-2/1/0       up    down
so-2/1/0.0     up    down inet goop
                                   iso
                                   inet6 v6in
                                   v6out

user@host > show interfaces filters ge-3/0/1
Interface      Admin Link Proto Input Filter      Output Filter
ge-3/0/1       up    up
ge-3/0/1.0     up    up    inet F1-ge-3/0/1.0-in
                                   inet F3-ge-3/0/1.0-in
                                   F2-ge-3/0/1.0-out

show interfaces filters user@host > show interfaces filters em0
(PTX Series Packet Interface      Admin Link Proto Input Filter      Output Filter
Transport Switches)   em0          up    up
em0.0            up    up    inet

```

show interfaces (PPPoE)

Syntax	<pre>show interfaces pp0.logical <brief detail extensive terse> <descriptions> <media> <snmp-index snmp-index> <statistics></pre>
Release Information	Command introduced before Junos OS Release 7.4.
Description	(J Series Services Routers, M120 routers, M320 routers, and MX Series routers only) Display status information about the PPPoE interface.
Options	<p>pp0.logical—Display standard status information about the PPPoE interface.</p> <p>brief detail extensive terse—(Optional) Display the specified level of output.</p> <p>descriptions—(Optional) Display interface description strings.</p> <p>media—(Optional) Display media-specific information about PPPoE interfaces.</p> <p>snmp-index snmp-index—(Optional) Display information for the specified SNMP index of the interface.</p> <p>statistics—(Optional) Display PPPoE interface statistics.</p>
Required Privilege Level	view
List of Sample Output	<p>show interfaces (PPPoE) on page 63</p> <p>show interfaces (PPPoE over Aggregated Ethernet) on page 63</p> <p>show interfaces brief (PPPoE) on page 63</p> <p>show interfaces detail (PPPoE) on page 64</p> <p>show interfaces detail (PPPoE on J Series Services Routers) on page 64</p> <p>show interfaces extensive (PPPoE on M120 and M320 Routers) on page 65</p>
Output Fields	Table 10 on page 57 lists the output fields for the show interfaces (PPPoE) command. Output fields are listed in the approximate order in which they appear.

Table 10: show interfaces (PPPoE) Output Fields

Field Name	Field Description	Level of Output
Physical Interface		
Physical interface	Name of the physical interface.	All levels
Enabled	State of the interface. Possible values are described in the “Enabled Field” section under Common Output Fields Description.	All levels
Interface index	Physical interface index number, which reflects its initialization sequence.	detail extensive none

Table 10: show interfaces (PPPoE) Output Fields (*continued*)

Field Name	Field Description	Level of Output
SNMP ifIndex	SNMP index number for the physical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Type	Physical interface type (PPPoE).	All levels
Link-level type	Encapsulation on the physical interface (PPPoE).	All levels
MTU	MTU size on the physical interface.	All levels
Clocking	Reference clock source. It can be Internal or External .	All levels
Speed	Speed at which the interface is running.	All levels
Device flags	Information about the physical device. Possible values are described in the "Device Flags" section under Common Output Fields Description.	All levels
Interface flags	Information about the interface. Possible values are described in the "Interface Flags" section under Common Output Fields Description.	All levels
Link type	Physical interface link type: full duplex or half duplex .	All levels
Link flags	Information about the interface. Possible values are described in the "Link Flags" section under Common Output Fields Description.	All levels
Input rate	Input rate in bits per second (bps) and packets per second (pps).	None specified
Output rate	Output rate in bps and pps.	None specified
Physical Info	Physical interface information.	All levels
Hold-times	Current interface hold-time up and hold-time down, in milliseconds.	detail extensive
Current address	Configured MAC address.	detail extensive
Hardware address	MAC address of the hardware.	detail extensive
Alternate link address	Backup address of the link.	detail extensive
Statistics last cleared	Time when the statistics for the interface were last set to zero.	detail extensive

Table 10: show interfaces (PPPoE) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Traffic statistics	<p>Number and rate of bytes and packets received and transmitted on the physical interface.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	detail extensive
IPv6 transit statistics	<p>Number of IPv6 transit bytes and packets received and transmitted on the physical interface if IPv6 statistics tracking is enabled.</p> <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	detail extensive
Input errors	<p>Input errors on the interface:</p> <ul style="list-style-type: none"> • Errors—Sum of incoming frame aborts and FCS errors. • Drops—Number of packets dropped by the input queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • Framing errors—Number of packets received with an invalid frame checksum (FCS). • Runts—Number of frames received that are smaller than the runt threshold. • Giants—Number of frames received that are larger than the giant threshold. • Policed discards—Number of frames that the incoming packet match code discarded because they were not recognized or not of interest. Usually, this field reports protocols that the Junos OS does not handle. • Resource errors—Sum of B chip Tx drops and IXP Tx net transmit drops. 	extensive
Output errors	<p>Output errors on the interface. The following paragraphs explain the counters whose meaning might not be obvious:</p> <ul style="list-style-type: none"> • Carrier transitions —Number of times the interface has gone from down to up. This number does not normally increment quickly, increasing only when the cable is unplugged, the far-end system is powered down and then up, or another problem occurs. If the number of carrier transitions increments quickly (perhaps once every 10 seconds), then the cable, the far-end system, or the PIM is malfunctioning. • Errors—Sum of the outgoing frame aborts and FCS errors. • Drops—Number of packets dropped by the output queue of the I/O Manager ASIC. If the interface is saturated, this number increments once for every packet that is dropped by the ASIC's RED mechanism. • MTU errors—Number of packets whose size exceeded the MTU of the interface. • Resource errors—Sum of B chip Tx drops and IXP Tx net transmit drops. 	extensive
Logical Interface		
Logical interface	Name of the logical interface.	All levels

Table 10: show interfaces (PPPoE) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Index	Logical interface index number (which reflects its initialization sequence).	detail extensive none
SNMP ifIndex	Logical interface SNMP interface index number.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Flags	Information about the logical interface. Possible values are described in the “Logical Interface Flags” section under Common Output Fields Description.	All levels
Encapsulation	Type of encapsulation configured on the logical interface.	All levels
PPP parameters	PPP status: <ul style="list-style-type: none"> • LCP restart timer—Length of time (in milliseconds) between successive Link Control Protocol (LCP) configuration requests. • NCP restart timer—Length of time (in milliseconds) between successive Network Control Protocol (NCP) configuration requests. 	detail
PPPoE	PPPoE status: <ul style="list-style-type: none"> • State—State of the logical interface (up or down). • Session ID—PPPoE session ID. • Service name—Type of service required. Can be used to indicate an Internet service provider (ISP) name or a class or quality of service. • Configured AC name—Configured access concentrator name. • Auto-reconnect timeout—Time after which to try to reconnect after a PPPoE session is terminated, in seconds. • Idle Timeout—Length of time (in seconds) that a connection can be idle before disconnecting. • Underlying interface—Interface on which PPPoE is running. 	All levels
Link	Name of the physical interfaces for member links in an aggregated Ethernet bundle for a PPPoE over aggregated Ethernet configuration. PPPoE traffic goes out on these interfaces.	All levels
Traffic statistics	Total number of bytes and packets received and transmitted on the logical interface. These statistics are the sum of the local and transit statistics. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. This counter usually takes less than 1 second to stabilize.	detail extensive
IPv6 transit statistics	Number of IPv6 transit bytes and packets received and transmitted on the logical interface if IPv6 statistics tracking is enabled. <ul style="list-style-type: none"> • Input bytes—Number of bytes received on the interface. • Output bytes—Number of bytes transmitted on the interface. • Input packets—Number of packets received on the interface. • Output packets—Number of packets transmitted on the interface. 	detail extensive

Table 10: show interfaces (PPPoE) Output Fields (*continued*)

Field Name	Field Description	Level of Output
Local statistics	Statistics for traffic received from and transmitted to the Routing Engine. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. This counter usually takes less than 1 second to stabilize.	detail extensive
Transit statistics	Statistics for traffic transiting the router. When a burst of traffic is received, the value in the output packet rate field might briefly exceed the peak cell rate. This counter usually takes less than 1 second to stabilize.	detail extensive
Keepalive settings	<p>(PPP and HDLC) Configured settings for keepalives.</p> <ul style="list-style-type: none"> interval seconds—The time in seconds between successive keepalive requests. The range is 10 seconds through 32,767 seconds, with a default of 10 seconds. down-count number—The number of keepalive packets a destination must fail to receive before the network takes a link down. The range is 1 through 255, with a default of 3. up-count number—The number of keepalive packets a destination must receive to change a link's status from down to up. The range is 1 through 255, with a default of 1. 	detail extensive
Keepalive statistics	<p>(PPP and HDLC) Information about keepalive packets.</p> <ul style="list-style-type: none"> Input—Number of keepalive packets received by PPP. <ul style="list-style-type: none"> (last seen 00:00:00 ago)—Time the last keepalive packet was received, in the format <i>hh:mm:ss</i>. Output—Number of keepalive packets sent by PPP and how long ago the last keepalive packets were sent and received. <ul style="list-style-type: none"> (last seen 00:00:00 ago)—Time the last keepalive packet was sent, in the format <i>hh:mm:ss</i>. <p>(MX Series routers with MPCs/MICs) When an MX Series router with MPCs/MICs is using PPP fast keepalive for a PPP link, the display does not include the number of keepalive packets received or sent, or the amount of time since the router received or sent the last keepalive packet.</p>	detail extensive
Input packets	Number of packets received on the logical interface.	None specified
Output packets	Number of packets transmitted on the logical interface.	None specified
LCP state	<p>(PPP) Link Control Protocol state.</p> <ul style="list-style-type: none"> Conf-ack-received—Acknowledgement was received. Conf-ack-sent—Acknowledgement was sent. Conf-req-sent—Request was sent. Down—LCP negotiation is incomplete (not yet completed or has failed). Not-configured—LCP is not configured on the interface. Opened—LCP negotiation is successful. 	none detail extensive

Table 10: show interfaces (PPPoE) Output Fields (*continued*)

Field Name	Field Description	Level of Output
NCP state	(PPP) Network Control Protocol state. <ul style="list-style-type: none"> • Conf-ack-received—Acknowledgement was received. • Conf-ack-sent—Acknowledgement was sent. • Conf-req-sent—Request was sent. • Down—NCP negotiation is incomplete (not yet completed or has failed). • Not-configured—NCP is not configured on the interface. • Opened—NCP negotiation is successful. 	detail extensive none
CHAP state	(PPP) Displays the state of the Challenge Handshake Authentication Protocol (CHAP) during its transaction. <ul style="list-style-type: none"> • Chap-Chal-received—Challenge was received but response not yet sent. • Chap-Chal-sent—Challenge was sent. • Chap-Resp-received—Response was received for the challenge sent, but CHAP has not yet moved into the Success state. (Most likely with RADIUS authentication.) • Chap-Resp-sent—Response was sent for the challenge received. • Closed—CHAP authentication is incomplete. • Failure—CHAP authentication failed. • Not-configured—CHAP is not configured on the interface. • Success—CHAP authentication was successful. 	none detail extensive
Protocol	Protocol family configured on the logical interface.	detail extensive none
<i>protocol-family</i>	Protocol family configured on the logical interface. If the protocol is inet , the IP address of the interface is also displayed.	brief
MTU	MTU size on the logical interface.	detail extensive none
Generation	Unique number for use by Juniper Networks technical support only.	detail extensive
Route table	Routing table in which the logical interface address is located. For example, 0 refers to the routing table inet.0 .	detail extensive none
Flags	Information about the protocol family flags. Possible values are described in the “Family Flags” section under Common Output Fields Description.	detail extensive none
Addresses, Flags	Information about the addresses configured for the protocol family. Possible values are described in the “Addresses Flags” section under Common Output Fields Description.	detail extensive none
Destination	IP address of the remote side of the connection.	detail extensive none
Local	IP address of the logical interface.	detail extensive none
Broadcast	Broadcast address.	detail extensive none

Sample Output

```

show interfaces (PPPoE) user@host> show interfaces pp0
Physical interface: pp0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 24
Type: PPPoE, Link-level type: PPPoE, MTU: 1532
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link type : Full-Duplex
Link flags : None
Input rate : 0 bps (0 pps)
Output rate : 0 bps (0 pps)

Logical interface pp0.0 (Index 72) (SNMP ifIndex 72)
Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPPoE
PPPoE:
State: SessionDown, Session ID: None,
Service name: None, Configured AC name: sapphire,
Auto-reconnect timeout: 100 seconds, Idle timeout: Never,
Underlying interface: at-5/0/0.0 (Index 70)
Input packets : 0
Output packets: 0
LCP state: Not-configured
NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Closed
Protocol inet, MTU: 100
Flags: User-MTU, Negotiate-Address

show interfaces (PPPoE over Aggregated Ethernet) user@host> show interfaces pp0.1073773821
Logical interface pp0.1073773821 (Index 80) (SNMP ifIndex 32584)
Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPPoE
PPPoE:
State: SessionUp, Session ID: 1,
Session AC name: alcor, Remote MAC address: 00:10:94:00:00:01,
Underlying interface: demux0.100 (Index 88)
Link:
ge-1/0/0.32767
ge-1/0/1.32767
Input packets : 6
Output packets: 6
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Closed
PAP state: Success
Protocol inet, MTU: 1500
Flags: Sendbroadcast-pkt-to-re
Addresses, Flags: Is-Primary
Local: 45.63.24.1

show interfaces brief (PPPoE) user@host> show interfaces pp0 brief
Physical interface: pp0, Enabled, Physical link is Up
Type: PPPoE, Link-level type: PPPoE, MTU: 1532, Speed: Unspecified
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps

Logical interface pp0.0
Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPPoE
PPPoE:

```

```

State: SessionDown, Session ID: None,
Service name: None, Configured AC name: sapphire,
Auto-reconnect timeout: 100 seconds, Idle timeout: Never,
Underlying interface: at-5/0/0.0 (Index 70)
inet

```

**show interfaces detail
(PPPoE)**

```

user@host> show interfaces pp0 detail
Physical interface: pp0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 24, Generation: 9
Type: PPPoE, Link-level type: PPPoE, MTU: 1532, Speed: Unspecified
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link type : Full-Duplex
Link flags : None
Physical info : Unspecified
Hold-times : Up 0 ms, Down 0 ms
Current address: Unspecified, Hardware address: Unspecified
Alternate link address: Unspecified
Statistics last cleared: Never
Traffic statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Logical interface pp0.0 (Index 72) (SNMP ifIndex 72) (Generation 14)
Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPPoE
PPPoE:
State: SessionDown, Session ID: None,
Service name: None, Configured AC name: sapphire,
Auto-reconnect timeout: 100 seconds, Idle timeout: Never,
Underlying interface: at-5/0/0.0 (Index 70)
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
LCP state: Not-configured
NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Closed
Protocol inet, MTU: 100, Generation: 14, Route table: 0
Flags: User-MTU, Negotiate-Address

```

**show interfaces detail
(PPPoE on J Series
Services Routers)**

```

user@host> show interfaces pp0 detail
Physical interface: pp0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 24, Generation: 9
Type: PPPoE, Link-level type: PPPoE, MTU: 1532, Speed: Unspecified
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link type : Full-Duplex
Link flags : None

```

```

Physical info : Unspecified
Hold-times   : Up 0 ms, Down 0 ms
Current address: Unspecified, Hardware address: Unspecified
Alternate link address: Unspecified
Statistics last cleared: Never
Traffic statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
Input errors:
Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
Policed discards: 0, Resource errors: 0
Output errors:
Carrier transitions: 0, Errors: 0, Drops: 0, MTU errors: 0,
Resource errors: 0

Logical interface pp0.0 (Index 72) (SNMP ifIndex 72) (Generation 14)
Flags: Hardware-Down Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPPoE
PPPoE:
State: SessionDown, Session ID: None,
Service name: None, Configured AC name: sapphire,
Auto-reconnect timeout: 100 seconds, Idle timeout: Never,
Underlying interface: at-5/0/0.0 (Index 70)
Traffic statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Local statistics:
Input bytes : 0
Output bytes : 0
Input packets: 0
Output packets: 0
Transit statistics:
Input bytes : 0 0 bps
Output bytes : 0 0 bps
Input packets: 0 0 pps
Output packets: 0 0 pps
LCP state: Not-configured
NCP state: inet: Not-configured, inet6: Not-configured, iso: Not-configured,
mpls: Not-configured
CHAP state: Closed
Protocol inet, MTU: 100, Generation: 14, Route table: 0
Flags: User-MTU, Negotiate-Address

```

**show interfaces
extensive (PPPoE on
M120 and M320
Routers)**

```

user@host> show interfaces pp0 extensive
Physical interface: pp0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 93, Generation: 129
Type: PPPoE, Link-level type: PPPoE, MTU: 1532, Speed: Unspecified
Device flags : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link type : Full-Duplex
Link flags : None
Physical info : Unspecified
Hold-times : Up 0 ms, Down 0 ms
Current address: Unspecified, Hardware address: Unspecified
Alternate link address: Unspecified
Statistics last cleared: Never
Traffic statistics:
Input bytes : 972192 0 bps

```

```

Output bytes :          975010          0 bps
Input packets:          1338          0 pps
Output packets:         1473          0 pps
IPv6 transit statistics:
  Input bytes :          0
  Output bytes :          0
  Input packets:         0
  Output packets:        0
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Policed discards:
0,
  Resource errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, MTU errors: 0, Resource errors:
0

Logical interface pp0.0 (Index 69) (SNMP ifIndex 96) (Generation 194)
Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPPoE
PPPoE:
  State: SessionUp, Session ID: 26,
  Session AC name: None, AC MAC address: 00:17:cb:48:c8:12,
  Service name: None, Configured AC name: None,
  Auto-reconnect timeout: Never, Idle timeout: Never,
  Underlying interface: ge-3/0/1.0 (Index 67)
Traffic statistics:
  Input bytes :          252
  Output bytes :          296
  Input packets:          7
  Output packets:         8
IPv6 transit statistics:
  Input bytes :          0
  Output bytes :          0
  Input packets:         0
  Output packets:        0
Local statistics:
  Input bytes :          252
  Output bytes :          296
  Input packets:          7
  Output packets:         8
Transit statistics:
  Input bytes :          0          0 bps
  Output bytes :          0          0 bps
  Input packets:         0          0 pps
  Output packets:        0          0 pps
IPv6 transit statistics:
  Input bytes :          0
  Output bytes :          0
  Input packets:         0
  Output packets:        0
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 1 (last seen 00:00:00 ago)
  Output: 1 (last sent 00:00:03 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Closed
PAP state: Closed
Protocol inet, MTU: 1492, Generation: 171, Route table: 0
Flags: None
Addresses, Flags: Is-Preferred Is-Primary

```


Destination: 12.12.12.2, Local: 12.12.12.1, Broadcast: Unspecified,
Generation: 206

show interfaces routing

Syntax	show interfaces routing <brief detail> <interface-name> <logical-system (all <i>logical-system-name</i>)>
Release Information	Command introduced before Junos OS Release 7.4.
Description	Display the state of the router's interfaces. Use this command for performing router diagnostics only, when you are determining whether the routing protocols and the Junos OS differ about the state of an interface.
Options	<p>none—Display standard information about the state of all router interfaces on all logical systems.</p> <p>brief detail—(Optional) Display the specified level of output.</p> <p>interface-name—(Optional) Name of a specific interface.</p> <p>logical-system (all <i>logical-system-name</i>)—(Optional) Perform this operation on all logical systems or on a particular logical system.</p>
Additional Information	For information about how to configure routing protocols, see the Junos OS Routing Protocols Configuration Guide . For information about related operational mode commands for routing instances and protocols, see the Junos OS Routing Protocols and Policies Command Reference .
Required Privilege Level	view
List of Sample Output	show interfaces routing brief on page 69 show interfaces routing brief (TX Matrix Plus Router) on page 70 show interfaces routing detail on page 70 show interfaces routing detail (TX Matrix Plus Router) on page 71
Output Fields	Table 11 on page 68 lists the output fields for the show interfaces routing command. Output fields are listed in the approximate order in which they appear.

Table 11: show interfaces routing Output Fields

Field Name	Field Description	Level of Output
Interface	Name of the physical interface.	none brief
State	State of the physical interface: Up or Down .	none brief
Addresses	Protocols and addresses configured on the interface.	none brief
Index	Interface index number, which reflects its initialization sequence.	detail

Table 11: show interfaces routing Output Fields (*continued*)

Field Name	Field Description	Level of Output
Refcount	Number of references to the interface in the routing software.	detail
State	State (Up or Down) and type of interface.	detail
Change	Reflects one or more of the following recent changes to the interface: <ul style="list-style-type: none"> • Add—The interface was just added. • Address—The interface's link-layer address has changed. • Delete—The interface is being deleted. • Encapsulation—The type of encapsulation on the interface has changed. • Metric—The interface's metric value has changed. • MTU—The interface's maximim transmission unit size has changed. • UpDown—The interface has made an up or down transition. 	detail
Up/down transitions	Number of times the interface has gone from Down to Up .	detail
Link layer	Describes the link layer of the interface.	detail
Encapsulation	Encapsulation on the interface.	detail
Bandwidth	Speed at which the interface is running.	detail
Protocol address	Information about the configuration of protocols on the interface: <ul style="list-style-type: none"> • Address—Address configured on the interface for the protocol type. • State—State (Up or down) and type of interface. • Change—Reflects one or more of the following recent changes to the interface: <ul style="list-style-type: none"> • Add—The interface was just added. • Address—The interface's address has changed. • Broadcast—The interface's broadcast address has changed. • Delete—The interface is being deleted. • Netmask—The interface's netmask has changed. • UpDown—The interface has made an up or down transition. • Preference—Preference value for the route for this address. • Metric—Metric value on the interface for the protocol type. • MTU—Maximim transmission unit value of the interface. • Local address—On a point-to-point link, the address of the local side of the link. Not used for multicast links. • Destination—For a point-to-point link, the address of the remote side of the link. For multicast links, the network address. 	detail

Sample Output

```
show interfaces user@host> show interfaces routing brief
routing brief
```

Interface	State	Addresses
so-5/0/3.0	Down	ISO enabled
so-5/0/2.0	Up	MPLS enabled ISO enabled INET 192.168.2.120 INET enabled
so-5/0/1.0	Up	MPLS enabled ISO enabled INET 192.168.2.130 INET enabled
at-1/0/0.3	Up	CCC enabled
at-1/0/0.2	Up	CCC enabled
at-1/0/0.0	Up	ISO enabled INET 192.168.90.10 INET enabled
lo0.0	Up	ISO 47.0005.80ff.f800.0000.0108.0001.1921.6800.5061.00 ISO enabled INET 127.0.0.1
fxp1.0	Up	
fxp0.0	Up	INET 192.168.6.90

**show interfaces
routing brief (TX Matrix
Plus Router)**

```
user@host> show interfaces routing brief
Interface      State  Addresses
...
ge-23/0/4.0    Up     INET  2.9.1.1
              ISO   enabled
              MPLS  enabled
ge-23/0/3.0    Up     INET  2.8.1.1
              ISO   enabled
              MPLS  enabled
ge-23/0/2.0    Up     INET  2.7.1.1
              ISO   enabled
              MPLS  enabled
ge-23/0/1.0    Up     INET  2.6.1.1
              ISO   enabled
              MPLS  enabled
ge-23/0/0.0    Up     INET  2.5.1.1
              ISO   enabled
              MPLS  enabled
ge-31/0/7.599  Up     INET  2.14.10.93
ge-31/0/7.598  Up     INET  2.14.10.89
ge-31/0/7.597  Up     INET  2.14.10.85
ge-31/0/7.596  Up     INET  2.14.10.81
ge-31/0/7.595  Up     INET  2.14.10.77
ge-31/0/7.594  Up     INET  2.14.10.73
...
ixgbe1.0       Up     INET  10.34.0.4
              INET  162.0.0.4
              INET6 fe80::200:1ff:fe22:4
              INET6 fec0::a:22:0:4
ixgbe0.0       Up     INET  10.34.0.4
              INET  162.0.0.4
              INET6 fe80::200:ff:fe22:4
              INET6 fec0::a:22:0:4
em0.0          Up     INET  192.168.178.11
```

**show interfaces
routing detail**

```
user@host> show interfaces routing detail
so-5/0/3.0
  Index: 15, Refcount: 2, State: Up <Broadcast PointToPoint Multicast> Change:<>

  Metric: 0, Up/down transitions: 0, Full-duplex
```

```

Link layer: HDLC serial line Encapsulation: PPP Bandwidth: 155Mbps
ISO address (null)
  State: <Broadcast PointToPoint Multicast> Change: <>
  Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
so-5/0/2.0
  Index: 14, Refcount: 7, State: <Up Broadcast PointToPoint Multicast> Change:<>

Metric: 0, Up/down transitions: 0, Full-duplex
Link layer: HDLC serial line Encapsulation: PPP Bandwidth: 155Mbps
MPLS address (null)
  State: <Up Broadcast PointToPoint Multicast> Change: <>
  Preference: 0 (120 down), Metric: 0, MTU: 4458 bytes
ISO address (null)
  State: <Up Broadcast PointToPoint Multicast> Change: <>
  Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
INET address 192.168.2.120
  State: <Up Broadcast PointToPoint Multicast Localup> Change: <>
  Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
  Local address: 192.168.2.120
  Destination: 192.168.2.110/32
INET address (null)
  State: <Up Broadcast PointToPoint Multicast> Change: <>
  Preference: 0 (120 down), Metric: 0, MTU: 4470 bytes
...

```

**show interfaces
routing detail (TX
Matrix Plus Router)**

```

user@host> show interfaces routing detail
ge-23/0/4.0
  Index: 77, Refcount: 5, State: <Up Broadcast Multicast> Change: <>
  0 metric, 0 up/down transitions, reth state 0, full-duplex
  Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 1000Mbps
  Link address #0 0.1d.b5.14.da.2d
  INET address 2.9.1.1
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <RT-Change>
    Preference 0, metric 0, MTU 1500 bytes
    Broadcast address 2.9.1.3
    Destination: 2.9.1.0/30
    System flags: <Is-Preferred Is-Primary>
  ISO address (null)
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1497 bytes
    System flags: <>
  MPLS address (null)
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1488 bytes
    System flags: <>
ge-23/0/3.0
  Index: 76, Refcount: 5, State: <Up Broadcast Multicast> Change: <>
  0 metric, 0 up/down transitions, reth state 0, full-duplex
  Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 1000Mbps
  Link address #0 0.1d.b5.14.da.2c
  INET address 2.8.1.1
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <RT-Change>
    Preference 0, metric 0, MTU 1500 bytes
    Broadcast address 2.8.1.3
    Destination: 2.8.1.0/30
    System flags: <Is-Preferred Is-Primary>
  ISO address (null)
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1497 bytes
    System flags: <>
  MPLS address (null)

```

```

        State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
        Preference 0, metric 0, MTU 1488 bytes
        System flags: <>
ge-23/0/2.0
  Index: 75, Refcount: 5, State: <Up Broadcast Multicast> Change: <>
  0 metric, 0 up/down transitions, reth state 0, full-duplex
  Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 1000Mbps
  Link address #0 0.1d.b5.14.da.2b
  INET address 2.7.1.1
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <RT-Change>
    Preference 0, metric 0, MTU 1500 bytes
    Broadcast address 2.7.1.3
    Destination: 2.7.1.0/30
    System flags: <Is-Preferred Is-Primary>
  ISO address (null)
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1497 bytes
    System flags: <>
  MPLS address (null)
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1488 bytes
    System flags: <>
ge-23/0/1.0
  Index: 74, Refcount: 5, State: <Up Broadcast Multicast> Change: <>
  0 metric, 0 up/down transitions, reth state 0, full-duplex
  Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 1000Mbps
  Link address #0 0.1d.b5.14.da.2a
  INET address 2.6.1.1
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <RT-Change>
    Preference 0, metric 0, MTU 1500 bytes
    Broadcast address 2.6.1.3
...
ixgbe1.0
  Index: 5, Refcount: 5, State: <Up Broadcast Multicast> Change: <>
  0 metric, 0 up/down transitions, reth state 0, full-duplex
  Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 1000Mbps
  Link address #0 2.0.1.22.0.4
  INET address 10.34.0.4
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1500 bytes
    Broadcast address 10.255.255.255
    Destination: 10.0.0.0/8
    System flags: <Is-Preferred>
  INET address 162.0.0.4
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1500 bytes
    Broadcast address 191.255.255.255
    Destination: 128.0.0.0/2
    System flags: <Primary Is-Preferred Is-Primary>
  INET6 address fe80::200:1ff:fe22:4
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1500 bytes
    Destination: fe80::/64
    System flags: <Is-Preferred>
  INET6 address fec0::a:22:0:4
    State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
    Preference 0, metric 0, MTU 1500 bytes
    Destination: fec0::/64
    System flags: <Is-Preferred Is-Primary>
ixgbe0.0
  Index: 4, Refcount: 5, State: <Up Broadcast Multicast> Change: <>

```

```

0 metric, 0 up/down transitions, reth state 0, full-duplex
Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 1000Mbps
Link address #0 2.0.0.22.0.4
INET address 10.34.0.4
  State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
  Preference 0, metric 0, MTU 1500 bytes
  Broadcast address 10.255.255.255
  Destination: 10.0.0.0/8
  System flags: <Is-Preferred>
INET address 162.0.0.4
  State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
  Preference 0, metric 0, MTU 1500 bytes
  Broadcast address 191.255.255.255
  Destination: 128.0.0.0/2
  System flags: <Primary Is-Default Is-Preferred Is-Primary>
INET6 address fe80::200:ff:fe22:4
  State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
  Preference 0, metric 0, MTU 1500 bytes
  Destination: fe80::/64
  System flags: <Is-Preferred>
INET6 address fec0::a:22:0:4
  State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
  Preference 0, metric 0, MTU 1500 bytes
  Destination: fec0::/64
  System flags: <Is-Default Is-Preferred Is-Primary>
em0.0
Index: 3, Refcount: 2, State: <Up Broadcast Multicast> Change: <>
0 metric, 0 up/down transitions, reth state 0, full-duplex
Link layer: Ethernet Encapsulation: Ethernet Bandwidth: 100Mbps
Link address #0 0.80.f9.26.0.c0
INET address 192.168.178.11
  State: <Up Broadcast Multicast Localup> Change: <> Flags: <>
  Preference 0, metric 0, MTU 1500 bytes
  Broadcast address 192.168.178.127
  Destination: 192.168.178.0/25
  System flags: <Is-Preferred Is-Primary>

```

show ppp interface

Syntax	<code>show ppp interface <i>interface-name</i></code> <code><extensive terse></code>
Release Information	Command introduced in Junos OS Release 7.5.
Description	Display information about PPP interfaces.
Options	<i>interface-name</i> —Name of a logical interface. extensive terse —(Optional) Display the specified level of output.
Required Privilege Level	view
List of Sample Output	show ppp interface on page 80 show ppp interface extensive on page 80 show ppp interface terse on page 81
Output Fields	Table 12 on page 74 lists the output fields for the show ppp interface command. Output fields are listed in the approximate order in which they appear.

Table 12: show ppp interface Output Fields

Field Name	Field Description	Level of Output
Session	Name of the logical interface on which the session is running.	All levels
Type	Session type: PPP.	All levels
Phase	PPP process phase: Authenticate , Pending , Establish , LCP , Network , Disabled , and Tunneled .	All levels
Session flags	Special conditions present in the session: Bundled , TCC , No-keepalives , Looped , Monitored , and NCP-only .	All levels
<i>protocol</i> State	Protocol state information. See specific protocol state fields for information.	None specified
AUTHENTICATION	Challenge-Handshake Authentication Protocol (CHAP) authentication state information or Password Authentication Protocol (PAP) state information. See the Authentication field description for further information.	None specified

Table 12: show ppp interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
LCP	<p>LCP information:</p> <ul style="list-style-type: none"> • State—LCP protocol state (all platforms except M120 and M320 routers): <ul style="list-style-type: none"> • Ack-rcvd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is not available for traffic. • Opened—Link is administratively available for traffic. • Req-sent—An attempt has been made to configure the connection. • State—LCP protocol state (M120 and M320 routers): <ul style="list-style-type: none"> • Ack-rcvd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is available (up), but no Open has occurred. • Closing—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Opened—Link is administratively available for traffic. A Configure-Ack has been both sent and received. • Req-sent—An attempt has been made to configure the connection. A Configure-Request has been sent but a Configure-Ack has not yet been received. • Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). • Stopped—The system is waiting for a Down event after the This-Layer-Finished action, or after sending a Terminate-Ack. • Stopping—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Last started—LCP state start time. • Last completed—LCP state completion time. 	extensive

Table 12: show ppp interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
	<ul style="list-style-type: none"> • Negotiated options: <ul style="list-style-type: none"> • ACFC—Address and-Control Field Compression. A configuration option that provides a method to negotiate the compression of the Data Link Layer Address and Control fields. • Asynchronous map—Asynchronous control character map. A configuration option used on asynchronous links such as telephone lines to identify control characters that must be replaced by a two-character sequence to prevent them from being interpreted by equipment used to establish the link. • Authentication protocol—Protocol used for authentication. This option provides a method to negotiate the use of a specific protocol for authentication. It requires a peer to authenticate itself before allowing network-layer protocol packets to be exchanged. By default, authentication is not required. • Authentication algorithm—Type of authentication algorithm. The Message Digest algorithm (MD5) is the only algorithm supported. • Endpoint discriminator class—For multilink PPP (MLPPP), a configuration option that identifies the system transmitting the packet. This option advises a system that the peer on this link could be the same as the peer on another existing link. • Magic number—A configuration option that provides a method to detect looped-back links and other data-link layer anomalies. By default, the magic number is not negotiated. • MRU—Maximum receive unit. A configuration option that may be sent to inform the peer that the implementation can receive larger packets, or to request that the peer send smaller packets. The default value is 1500 octets. • MRRU—For multilink PPP, the maximum receive reconstructed unit. A configuration option that specifies the maximum number of octets in the Information fields of reassembled packets. • Multilink header suspendable classes—For MLPPP, an LCP option that advises the peer that the implementation wishes to receive fragments with a format given by the code number, with the maximum number of suspendable classes given. • Multilink header format classes—For MLPPP, an LCP option that advises the peer that the implementation wishes to receive fragments with a format given by the code number. • PFC—Protocol-Field-Compression. A configuration option that provides a method to negotiate the compression of the PPP Protocol field. • short sequence—For MLPPP, an option that advises the peer that the implementation wishes to receive fragments with short, 12-bit sequence numbers. 	

Table 12: show ppp interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
Authentication	<p>CHAP or PAP authentication state information. For CHAP authentication:</p> <ul style="list-style-type: none"> • Chap-ans-rcvd—Packet was sent from the peer, indicating that the peer received the Chap-resp-sent packet. • Chap-ans-sent—Packet was sent from the authenticator, indicating that the authenticator received the peer's Chap-resp-rcvd packet. • Chap-chal-rcvd—Challenge packet has been received by the peer. • Chap-chal-sent—Challenge packet has been sent by the authenticator to begin the CHAP protocol or has been transmitted at any time during the Network-Layer Protocol (NCP) phase to ensure that the connection has not been altered. • Chap-resp-rcvd—CHAP response packet has been received by the authenticator. • Chap-resp-sent—CHAP response packet has been sent to the authenticator. • Closed—Link is not available for authentication. • Failure—Authenticator compares the response value in the response packet from the peer with its own response value, but the value does not match. Authentication fails. • Success—Authenticator compares the response value in the response packet from the peer with its own response value, and the value matches. Authentication is successful. <p>For PAP authentication:</p> <ul style="list-style-type: none"> • Pap-resp-sent—PAP response sent to peer (ACK/NACK). • Pap-req-rcvd—PAP request packet received from peer. • Pap-resp-rcvd—PAP response received from the peer (ACK/NACK). • Pap-req-sent—PAP request packet sent to the peer. • Closed—Link is not available for authentication. • Failure—Authenticator compares the response value in the response packet from the peer with its own response value, but the value does not match. Authentication fails. • Success—Authenticator compares the response value in the response packet from the peer with its own response value, and the value matches. Authentication is successful. 	None specified

Table 12: show ppp interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
IPCP	<p>Internet Protocol Control Protocol (IPCP) information.</p> <ul style="list-style-type: none"> • State—(All platforms except M120 and M320 routers) One of the following values: <ul style="list-style-type: none"> • Ack-rcvd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is not available for traffic. • Opened—Link is administratively available for traffic. • Req-sent—An attempt has been made to configure the connection. • State—(M120 and M320 routers) One of the following values: <ul style="list-style-type: none"> • Ack-rcvd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is available (up), but no Open has occurred. • Closing—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Opened—Link is administratively available for traffic. A Configure-Ack has been both sent and received. • Req-sent—An attempt has been made to configure the connection. A Configure-Request has been sent but a Configure-Ack has not yet been received. • Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). • Stopped—The system is waiting for a Down event after the This-Layer-Finished action, or after sending a Terminate-Ack. • Stopping—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Last started—IPCP state start time. • Last completed—IPCP state authentication completion time. • Negotiated options: <ul style="list-style-type: none"> • compression protocol—Negotiate the use of a specific compression protocol. By default, compression is not enabled. • local address—Desired local address of the sender of a Configure-Request. If all four octets are set to zero, the peer provides the IP address. • primary DNS server—Negotiate with the remote peer to select the address of the primary DNS server to be used on the local end of the link. • primary WINS server—Negotiate with the remote peer to select the address of the primary WINS server to be used on the local end of the link. • remote address—IP address of the remote end of the link in dotted quad notation. • secondary DNS server—Negotiate with the remote peer to select the address of the secondary DNS server to be used on the local end of the link. • secondary WINS server—Negotiate with the remote peer to select the address of the secondary WINS server to be used on the local end of the link. 	extensive

Table 12: show ppp interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
IPV6CP	<p>Internet Protocol version 6 Control Protocol (IPV6CP) information.</p> <ul style="list-style-type: none"> • State—(All platforms except M120 and M320 routers) One of the following values: <ul style="list-style-type: none"> • Ack-rcvd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is not available for traffic. • Opened—Link is administratively available for traffic. • Req-sent—An attempt has been made to configure the connection. • State—(M120 and M320 routers) One of the following values: <ul style="list-style-type: none"> • Ack-rcvd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is available (up), but no Open has occurred. • Closing—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Opened—Link is administratively available for traffic. A Configure-Ack has been both sent and received. • Req-sent—An attempt has been made to configure the connection. A Configure-Request has been sent but a Configure-Ack has not yet been received. • Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). • Stopped—The system is waiting for a Down event after the This-Layer-Finished action, or after sending a Terminate-Ack. • Stopping—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Last started—IPV6CP state start time. • Last completed—IPV6CP state authentication completion time. • Negotiated options: <ul style="list-style-type: none"> • local interface identifier—Desired local address of the sender of a Configure-Request. If all four octets are set to zero, the peer provides the IP address. • remote interface identifier—IP address of the remote end of the link in dotted quad notation. 	extensive
OSINLCP State	<p>OSI Network Layer Control Protocol (OSINLCP) protocol state information (all platforms except M120 and M320 routers):</p> <ul style="list-style-type: none"> • State: <ul style="list-style-type: none"> • Ack-rcvd—Configure-Request has been sent and Configure-Ack has been received. • Ack-sent—Configure-Request and Configure-Ack have both been sent, but Configure-Ack has not yet been received. • Closed—Link is not available for traffic. • Opened—Link is administratively available for traffic. • Req-sent—Attempt has been made to configure the connection. • Last started—OSINLCP state start time. • Last completed—OSINLCP state completion time. 	extensive

Table 12: show ppp interface Output Fields (*continued*)

Field Name	Field Description	Level of Output
TAGCP	<p>TAGCP information.</p> <ul style="list-style-type: none"> • State—(All platforms except M120 and M320 routers) One of the following values: <ul style="list-style-type: none"> • Ack-rcvcd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is not available for traffic. • Opened—Link is administratively available for traffic. • Req-sent—An attempt has been made to configure the connection. • State—(M120 and M320 routers) One of the following values: <ul style="list-style-type: none"> • Ack-rcvcd—A Configure-Request has been sent and a Configure-Ack has been received. • Ack-sent—A Configure-Request and a Configure-Ack have both been sent, but a Configure-Ack has not yet been received. • Closed—Link is available (up), but no Open has occurred. • Closing—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Opened—Link is administratively available for traffic. A Configure-Ack has been both sent and received. • Req-sent—An attempt has been made to configure the connection. A Configure-Request has been sent but a Configure-Ack has not yet been received. • Starting—An administrative Open has been initiated, but the lower layer is still unavailable (Down). • Stopped—The system is waiting for a Down event after the This-Layer-Finished action, or after sending a Terminate-Ack. • Stopping—A Terminate-Request has been sent but a Terminate-Ack has not yet been received. • Last started—TAGCP state start time. • Last completed—TAGCP state authentication completion time. 	extensive none

Sample Output

```

show ppp interface  user@host> show ppp interface so-1/3/0.0
                    Session so-1/3/0.0, Type: PPP, Phase: Authenticate
                    Session flags: Monitored
                    LCP State: Opened
                    AUTHENTICATION: CHAP State: Chap-resp-sent, Chap-ans-sent
                    IPCP State: Closed, OSINLCP State: Closed

show ppp interface  user@host> show ppp interface so-0/0/3.0 extensive
extensive          Session so-0/0/3.0, Type: PPP, Phase: Network
                    LCP
                    State: Opened
                    Last started: 2007-01-29 10:43:50 PST
                    Last completed: 2007-01-29 10:43:50 PST
                    Negotiated options:
                    Authentication protocol: PAP, Magic number: 2341124815, MRU: 4470
                    Authentication: PAP
                    State: Success

```

Last started: 2007-01-29 10:43:50 PST
Last completed: 2007-01-29 10:43:50 PST
IPCP
State: Opened
Last started: 2007-01-29 10:43:50 PST
Last completed: 2007-01-29 10:43:50 PST
Negotiated options:
Local address: 10.10.10.1, Remote address: 10.10.10.2

show ppp interface	user@host> show ppp interface so-1/3/0 terse			
terse	Session name	Session type	Session phase	Session flags
	so-1/3/0.0	PPP	Authenticate	Monitored

CHAPTER 9

Subscriber Management Subscriber CLI Commands

show subscribers

Syntax `show subscribers`
 `<address address>`
 `<client-type client-type>`
 `<interface interface>`
 `<logical-system logical-system>`
 `<mac-address mac-address>`
 `<profile-name profile-name>`
 `<routing-instance routing-instance>`
 `<stacked-vlan-id stacked-vlan-id>`
 `<subscriber-state subscriber-state>`
 `<vlan-id vlan-id>`
 `<count | detail | extensive | summary (all | logical-system logical-system | routing-instance routing-instance) | terse>`

Release Information Command introduced in Junos OS Release 9.3.
 Command introduced in Junos OS Release 9.3 for EX Series switches.
 client-type, **mac-address**, **subscriber-state**, **extensive**, and **summary** options introduced in Junos OS Release 10.2.
 count option usage with other options introduced in Junos OS Release 10.2.
 Command introduced in Junos OS Release 11.1 for the QFX Series.

Description Display information for active subscribers.

Options **address**—(Optional) Display subscribers whose IP address matches the specified address.

client-type—(Optional) Display subscribers whose client type matches the specified client type (DHCP, L2TP, PPP, PPPOE, VLAN, or static).

count—(Optional) Display the count of total subscribers and active subscribers for any specified option. You can use the **count** option alone or with the **address**, **client-type**, **interface**, **logical-system**, **mac-address**, **profile-name**, **routing-instance**, **stacked-vlan-id**, **subscriber-state**, or **vlan-id** options.

id—(Optional) Display a specific subscriber session whose session id matches the specified subscriber ID. You can display subscriber IDs by using the **show subscribers extensive** or the **show subscribers interface extensive** commands.

interface—(Optional) Display subscribers whose interface matches the specified interface.

logical-system—(Optional) Display subscribers whose logical system matches the specified logical system.

mac-address—(Optional) Display subscribers whose MAC address matches the specified MAC address.

profile-name—(Optional) Display subscribers whose dynamic profile matches the specified profile name.

routing-instance—(Optional) Display subscribers whose routing instance matches the specified routing instance.

subscriber-state—(Optional) Display subscribers whose subscriber state matches the specified subscriber state (ACTIVE, CONFIGURED, INIT, TERMINATED, or TERMINATING).

vlan-id—(Optional) Display subscribers whose VLAN ID matches the specified VLAN ID.

stacked-vlan-id—(Optional) Display subscribers whose stacked VLAN ID matches the specified stacked VLAN ID.

detail | extensive | summary | terse—(Optional) Display the specified level of output.



NOTE: Due to display limitations, logical system and routing instance output values are truncated when necessary.

Required Privilege Level	view
List of Sample Output	show subscribers (IPv4) on page 88 show subscribers (IPv6) on page 88 show subscribers (IPv4 and IPv6 Dual Stack) on page 88 show subscribers (LNS on MX Series Routers) on page 88 show subscribers detail (IPv4) on page 89 show subscribers detail (IPv6) on page 89 show subscribers detail (IPv6 Static Demux Interface) on page 89 show subscribers detail (L2TP LNS Subscribers on MX Series Routers) on page 89 show subscribers detail (Tunneled Subscriber) on page 90 show subscribers interface on page 90 show subscribers logical-system on page 90 show subscribers count on page 91 show subscribers routing-instance inst1 count on page 91 show subscribers vlan-id on page 91 show subscribers vlan-id detail on page 91 show subscribers stacked-vlan-id detail on page 91 show subscribers stacked-vlan-id vlan-id detail (Combined Output) on page 91 show subscribers stacked-vlan-id vlan-id interface detail (Combined Output for a Specific Interface) on page 91 show subscribers client-type dhcp detail on page 92 show subscribers extensive on page 92 show subscribers extensive (L2TP LNS Subscribers on MX Series Routers) on page 92 show subscribers summary on page 93 show subscribers summary all on page 93 show subscribers terse on page 93
Output Fields	Table 13 on page 86 lists the output fields for the show subscribers command. Output fields are listed in the approximate order in which they appear.

Table 13: show subscribers Output Fields

Field Name	Field Description
User Name	Name of subscriber.
Type	Subscriber client type (DHCP, L2TP, PPP, PPPoE, STATIC-INTERFACE, VLAN).
IP Address	Subscriber IPv4 address.
IP Netmask	Subscriber IP netmask.
IPv6 Address	Subscriber IPv6 address, or multiple addresses.
IPv6 Prefix	Subscriber IPv6 prefix.
IPv6 Address Pool	Subscriber IPv6 address pool. The IPv6 address pool is used to allocate IPv6 prefixes to the DHCPv6 clients.
IPv6 Network Prefix Length	Length of the network portion of the IPv6 address.
IPv6 Prefix Length	Length of the subscriber IPv6 prefix.
Logical System	Logical system associated with the subscriber.
Routing Instance	Routing instance associated with the subscriber.
Interface	Interface associated with the subscriber. The router or switch displays subscribers whose interface matches or begins with the specified interface. The * character indicates a continuation of addresses for the same session.
Interface Type	Whether the subscriber interface is Static or Dynamic .
Dynamic Profile Name	Dynamic profile used for the subscriber.
MAC Address	MAC address associated with the subscriber.
State	Current state of the subscriber session (Init , Configured , Active , Terminating , Tunneled).
VLAN Id	VLAN ID associated with the subscriber in the form <i>tpid.vlan-id</i> .
Stacked VLAN Id	Stacked VLAN ID associated with the subscriber in the form <i>tpid.vlan-id</i> .
RADIUS Accounting ID	RADIUS accounting ID associated with the subscriber.
Agent Circuit ID	Option 82 agent circuit ID associated with the subscriber. The ID is displayed as an ASCII string unless the value has nonprintable characters, in which case it is displayed in hexadecimal format.
Agent Remote ID	Option 82 agent remote ID associated with the subscriber. The ID is displayed as an ASCII string unless the value has nonprintable characters, in which case it is displayed in hexadecimal format.

Table 13: show subscribers Output Fields (*continued*)

Field Name	Field Description
DHCP Relay IP Address	IP address used by the DHCP relay agent.
Login Time	Date and time at which the subscriber logged in.
DHCP Options	len = number of hex values in the message. The hex values specify the type, length, value (TLV) for DHCP options, as defined in RFC 2132.
Session ID	ID number for a subscriber service session.
Service Sessions	Number of service sessions (that is, a service activated using RADIUS CoA) associated with the subscribers.
Service Session Name	Service session profile name.
Session Timeout (seconds)	Number of seconds of access provided to the subscriber before the session is automatically terminated.
Idle Timeout (seconds)	Number of seconds subscriber can be idle before the session is automatically terminated.
ADF IPv4 Input Filter Name	Name assigned to the Ascend-Data-Filter (ADF) interface IPv4 input filter (client or service session). The filter name is followed by the rules (in hexadecimal format) associated with the ADF filter and the decoded rule in Junos OS filter style.
ADF IPv4 Output Filter Name	Name assigned to the Ascend-Data-Filter (ADF) interface IPv4 output filter (client or service session). The filter name is followed by the rules (in hexadecimal format) associated with the ADF filter and the decoded rule in Junos OS filter style.
ADF IPv6 Input Filter Name	Name assigned to the Ascend-Data-Filter (ADF) interface IPv6 input filter (client or service session). The filter name is followed by the rules (in hexadecimal format) associated with the ADF filter and the decoded rule in Junos OS filter style.
ADF IPv6 Output Filter Name	Name assigned to the Ascend-Data-Filter (ADF) interface IPv6 output filter (client or service session). The filter name is followed by the rules (in hexadecimal format) associated with the ADF filter and the decoded rule in Junos OS filter style.
IPv4 Input Filter Name	Name assigned to the IPv4 input filter (client or service session).
IPv4 Output Filter Name	Name assigned to the IPv4 output filter (client or service session).
IPv6 Input Filter Name	Name assigned to the IPv6 input filter (client or service session).
IPv6 Output Filter Name	Name assigned to the IPv6 output filter (client or service session).
IFL Input Filter Name	Name assigned to the logical interface input filter (client or service session).
IFL Output Filter Name	Name assigned to the logical interface output filter (client or service session).

Table 13: show subscribers Output Fields (*continued*)

Field Name	Field Description
Subscribers by State	<p>Number of subscribers summarized by state. The summary information includes the following:</p> <ul style="list-style-type: none"> Init—Number of subscriber currently in the initialization state. Configured—Number of configured subscribers. Active—Number of active subscribers. Terminating—Number of subscribers currently terminating. Terminated—Number of terminated subscribers. <p>Summary information includes subscriber counts per state and the total number of subscribers.</p>
Subscribers by Client Type	<p>Number of subscribers summarized by client type. Client types can include DHCP, VLAN, PPP, PPPOE, L2TP, and static. Summary information includes subscriber counts per client type and the total number of subscribers.</p>
Subscribers by LS:RI	<p>Number of subscribers summarized by logical system:routing instance (LS:RI) combination. Summary information includes subscriber counts per LS:RI and the total number of subscribers.</p>

Sample Output

show subscribers (IPv4)	<pre> user@host> show subscribers Interface IP Address/VLAN ID User Name LS:RI ge-1/3/0.1073741824 100 WHOLESALE-CLIENT default:default demux0.1073741824 100.0.0.10 RETAILER1-CLIENT test1:retailer1 demux0.1073741825 101.0.0.3 RETAILER2-CLIENT test1:retailer2 demux0.1073741826 102.0.0.3 </pre>
show subscribers (IPv6)	<pre> user@host> show subscribers Interface IP Address/VLAN ID User Name LS:RI ge-1/0/0.0 2001::c0:0:0:0/74 WHOLESALE-CLIENT default:default * 2002::1/128 subscriber-25 default:default </pre>
show subscribers (IPv4 and IPv6 Dual Stack)	<pre> user@host> show subscribers Interface IP Address/VLAN ID User Name LS:RI demux0.1073741834 0x8100.1002 0x8100.1 default:default demux0.1073741835 0x8100.1001 0x8100.1 default:default pp0.1073741836 61.1.1.1 dualstackuser1@ISP1.com default:ASP-1 * 2041:1:1::/48 * 2061:1:1:1::/64 pp0.1073741837 23.1.1.3 dualstackuser2@ISP1.com default:ASP-1 * 2001:1:2:5::/64 </pre>
show subscribers (LNS on MX Series Routers)	<pre> user@host> show subscribers Interface IP Address/VLAN ID User Name LS:RI si-4/0/0.1 192.168.4.1 xyz@example.com default:default </pre>

```

show subscribers user@host> show subscribers detail
detail (IPv4) Type: DHCP
IP Address: 100.20.9.7
IP Netmask: 255.255.0.0
Logical System: default
Routing Instance: default
Interface: demux0.1073744127
Interface type: Dynamic
Dynamic Profile Name: dhcp-demux-prof
MAC Address: 00:10:95:00:00:98
State: Active
Radius Accounting ID: jnpr :2304
Session Timeout (seconds): 3600
Idle Timeout (seconds): 600
Login Time: 2009-08-25 14:43:52 PDT
DHCP Options: len 52
35 01 01 39 02 02 40 3d 07 01 00 10 94 00 00 08 33 04 00 00
00 3c 0c 15 63 6c 69 65 6e 74 5f 50 6f 72 74 20 2f 2f 36 2f
33 2d 37 2d 30 37 05 01 06 0f 21 2c
Service Sessions: 2

```

```

show subscribers user@host> show subscribers detail
detail (IPv6) Type: DHCP
User Name: pd-user1
IPv6 Prefix: 2002:db2:ffff:1::/64
Logical System: default
Routing Instance: default
Interface: ge-3/1/3.2
Interface type: Static
MAC Address: 00:51:ff:ff:00:03
State: Active
Radius Accounting ID: 1
Session ID: 1
Login Time: 2011-08-25 12:12:26 PDT
DHCP Options: len 42
00 08 00 02 00 00 00 01 00 0a 00 03 00 01 00 51 ff ff 00 03
00 06 00 02 00 19 00 19 00 0c 00 00 00 00 00 00 00 00 00
00 00

```

```

show subscribers user@host> show subscribers detail
detail (IPv6 Static Type: STATIC-INTERFACE
Demux Interface) User Name: demux0.1@jnpr.net
IPv6 Prefix: 1:2:3:4:5:6:7:aa/128
Logical System: default
Routing Instance: default
Interface: demux0.1
Interface type: Static
Dynamic Profile Name: junos-default-profile
State: Active
Radius Accounting ID: 185
Login Time: 2010-05-18 14:33:56 EDT

```

```

show subscribers user@host> show subscribers detail
detail (L2TP LNS Type: L2TP
Subscribers on MX User Name: user1@jnpr.net
Series Routers) IP Address: 10.1.32.58
IP Netmask: 255.255.0.0
Logical System: default
Routing Instance: default
Interface: si-5/2/0.1073749824

```

```
Interface type: Dynamic
Dynamic Profile Name: dyn-lns-profile2
Dynamic Profile Version: 1
State: Active
Radius Accounting ID: 8001
Session ID: 8001
Login Time: 2011-04-25 20:27:50 IST

show subscribers user@host> show subscribers detail
detail (Tunneled Type: PPPoE
Subscriber) User Name: user1@example.com
Logical System: default
Routing Instance: default
Interface: pp0.1
State: Active, Tunneled
Radius Accounting ID: 512

show subscribers user@host> show subscribers interface demux0.1073741826 extensive
interface Type: VLAN
User Name: test1@test.com
Logical System: default
Routing Instance: testnet
Interface: demux0.1073741826
Interface type: Dynamic
Dynamic Profile Name: profile-vdemux-relay-23qos
MAC Address: 00:00:6e:56:01:04
State: Active
Radius Accounting ID: 12
Session ID: 12
Stacked VLAN Id: 0x8100.1500
VLAN Id: 0x8100.2902
Login Time: 2011-10-20 16:21:59 EST

Type: DHCP
User Name: test1@test.com
IP Address: 172.16.200.6
IP Netmask: 255.255.255.0
Logical System: default
Routing Instance: testnet
Interface: demux0.1073741826
Interface type: Static
MAC Address: 00:00:6e:56:01:04
State: Active
Radius Accounting ID: 21
Session ID: 21
Login Time: 2011-10-20 16:24:33 EST
Service Sessions: 2

Service Session ID: 25
Service Session Name: SUB-QOS
State: Active

Service Session ID: 26
Service Session Name: service-cb-content
State: Active
IPv4 Input Filter Name: content-cb-in-demux0.1073741826-in
IPv4 Output Filter Name: content-cb-out-demux0.1073741826-out

show subscribers user@host> show subscribers logical-system test1 terse
logical-system
```


	Interface	IP Address/VLAN ID	User Name	LS:RI
	demux0.1073741825	101.0.0.3	RETAILER1-CLIENT	test1:retailer1
	demux0.1073741826	102.0.0.3	RETAILER2-CLIENT	test1:retailer2


```

show subscribers count      user@host> show subscribers count
                               Total Subscribers: 188, Active Subscribers: 188

show subscribers routing-instance inst1 count
user@host> show subscribers routing-instance inst1 count
Total Subscribers: 188, Active Subscribers: 183

show subscribers vlan-id    user@host> show subscribers vlan-id 100
                               Interface      IP Address      User Name
                               ge-1/0/0.1073741824
                               ge-1/2/0.1073741825

show subscribers vlan-id detail
user@host> show subscribers vlan-id 100 detail
Type: VLAN
Interface: ge-1/0/0.1073741824
Interface type: Dynamic
Dynamic Profile Name: vlan-prof-tpid
State: Active
VLAN Id: 100
Login Time: 2009-03-11 06:48:54 PDT

Type: VLAN
Interface: ge-1/2/0.1073741825
Interface type: Dynamic
Dynamic Profile Name: vlan-prof-tpid
State: Active
VLAN Id: 100
Login Time: 2009-03-11 06:48:54 PDT

show subscribers stacked-vlan-id detail
user@host> show subscribers stacked-vlan-id 101 detail
Type: VLAN
Interface: ge-1/2/0.1073741824
Interface type: Dynamic
Dynamic Profile Name: svlan-prof
State: Active
Stacked VLAN Id: 0x8100.101
VLAN Id: 0x8100.100
Login Time: 2009-03-27 11:57:19 PDT

show subscribers stacked-vlan-id vlan-id detail (Combined Output)
user@host> show subscribers stacked-vlan-id 101 vlan-id 100 detail
Type: VLAN
Interface: ge-1/2/0.1073741824
Interface type: Dynamic
Dynamic Profile Name: svlan-prof
State: Active
Stacked VLAN Id: 0x8100.101
VLAN Id: 0x8100.100
Login Time: 2009-03-27 11:57:19 PDT

show subscribers stacked-vlan-id vlan-id interface detail (Combined Output for a Specific Interface)
user@host> show subscribers stacked-vlan-id 101 vlan-id 100 interface ge-1/2/0.* detail
Type: VLAN
Interface: ge-1/2/0.1073741824
Interface type: Dynamic
Dynamic Profile Name: svlan-prof
State: Active

```

Stacked VLAN Id: 0x8100.101
VLAN Id: 0x8100.100
Login Time: 2009-03-27 11:57:19 PDT

show subscribers user@host> **show subscribers client-type dhcp detail**
client-type dhcp detail

Type: DHCP
IP Address: 100.20.9.7
IP Netmask: 255.255.0.0
Logical System: default
Routing Instance: default
Interface: demux0.1073744127
Interface type: Dynamic
Dynamic Profile Name: dhcp-demux-prof
MAC Address: 00:10:95:00:00:98
State: Active
Radius Accounting ID: jnpr :2304
Login Time: 2009-08-25 14:43:52 PDT

Type: DHCP
IP Address: 100.20.10.7
IP Netmask: 255.255.0.0
Logical System: default
Routing Instance: default
Interface: demux0.1073744383
Interface type: Dynamic
Dynamic Profile Name: dhcp-demux-prof
MAC Address: 00:10:94:00:01:f3
State: Active
Radius Accounting ID: jnpr :2560
Login Time: 2009-08-25 14:43:56 PDT

show subscribers user@host> **show subscribers extensive**
extensive

Type: DHCP
User Name: pd-user1
IPv6 Prefix: 2002:db2:ffff:1::/64
Logical System: default
Routing Instance: default
Interface: ge-3/1/3.2
Interface type: Static
MAC Address: 00:51:ff:ff:00:03
State: Active
Radius Accounting ID: 1
Session ID: 1
Login Time: 2011-08-25 12:12:26 PDT
DHCP Options: len 42
00 08 00 02 00 00 00 01 00 0a 00 03 00 01 00 51 ff ff 00 03
00 06 00 02 00 19 00 19 00 0c 00 00 00 00 00 00 00 00
00 00
IPv6 Address Pool: pd_pool
IPv6 Network Prefix Length: 48

show subscribers user@host> **show subscribers extensive**
extensive (L2TP LNS Type: L2TP
Subscribers on MX User Name: user1@jnpr.net
Series Routers) IP Address: 10.1.32.58
 IP Netmask: 255.255.0.0

Logical System: default
Routing Instance: default
Interface: si-5/2/0.1073749824
Interface type: Dynamic

```

Dynamic Profile Name: dyn-lns-profile2
Dynamic Profile Version: 1
State: Active
Radius Accounting ID: 8001
Session ID: 8001
Login Time: 2011-04-25 20:27:50 IST
IPv4 Input Filter Name: classify-si-5/2/0.1073749824-in
IPv4 Output Filter Name: classify-si-5/2/0.1073749824-out

```

show subscribers summary user@host> show subscribers summary

```

Subscribers by State
Init          3
Configured    2
Active       183
Terminating   2
Terminated    1

TOTAL        191

Subscribers by Client Type
DHCP         107
PPP          76
VLAN         8

TOTAL        191

```

show subscribers summary all user@host> show subscribers summary all

```

Subscribers by State
Init          3
Configured    2
Active       183
Terminating   2
Terminated    1

TOTAL        191

Subscribers by Client Type
DHCP         107
PPP          76
VLAN         8

TOTAL        191

Subscribers by LS:RI
default:default 1
default:ri1     28
default:ri2     16
ls1:default     22
ls1:riA         38
ls1:riB         44
logsysX:routinstY 42

TOTAL        191

```

show subscribers terse user@host> show subscribers summary terse

Interface	IP Address/VLAN ID	User Name	LS:RI
ge-1/3/0.1073741824	100		default:default
demux0.1073741824	100.0.0.10	WHOLESALE-CLIENT	default:default

demux0.1073741825	101.0.0.3	RETAILER1-CLIENT	test1:retailer1
demux0.1073741826	102.0.0.3	RETAILER2-CLIENT	test1:retailer2

PART 4

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