



Junos[®] OS

Source Class Usage Feature Guide

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Release 13.2
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About the Documentation

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- Supported Platforms on page ix
- Using the Examples in This Manual on page ix
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- Documentation Feedback on page xiii
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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>.

Supported Platforms

For the features described in this document, the following platforms are supported:

- MX Series
- T Series
- M Series

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.xml;
    }
  }
}
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.xml; }
```

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 *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

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

Convention	Description	Examples
<i>Italic text like this</i>	<ul style="list-style-type: none"> Introduces or emphasizes 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>
<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; 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 metric>;
| (pipe symbol)	Indicates a choice between the mutually exclusive keywords or variables on either side of the symbol. The set of choices is often enclosed in parentheses for clarity.	broadcast | multicast <i>(string1 | string2 | 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 [community-ids]
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.	
GUI Conventions		
Bold text like this	Represents 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 menu 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

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

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

Self-Help Online Tools and Resources

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

- Find CSC offerings: <http://www.juniper.net/customers/support/>
- Search for known bugs: <http://www2.juniper.net/kb/>
- Find product documentation: <http://www.juniper.net/techpubs/>
- Find solutions and answer questions using our Knowledge Base: <http://kb.juniper.net/>
- Download the latest versions of software and review release notes: <http://www.juniper.net/customers/csc/software/>
- Search technical bulletins for relevant hardware and software notifications: <https://www.juniper.net/alerts/>

- Join and participate in the Juniper Networks Community Forum:
<http://www.juniper.net/company/communities/>
- Open a case online in the CSC Case Management tool: <http://www.juniper.net/cm/>

To verify service entitlement by product serial number, use our Serial Number Entitlement (SNE) Tool: <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

- [Product Overview on page 3](#)
- [System Requirements on page 7](#)
- [Glossary on page 9](#)

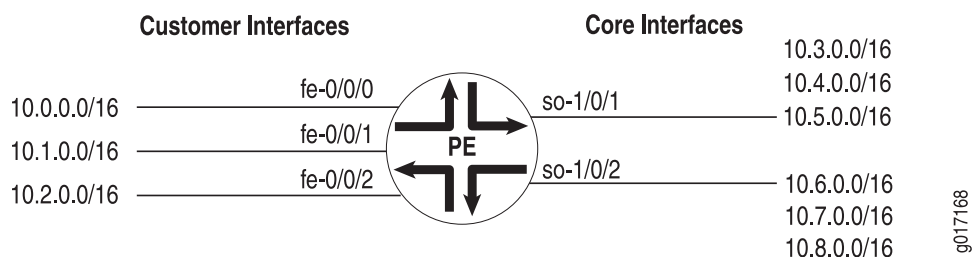
Product Overview

- [Overview of Source Class Usage on page 3](#)
- [Guidelines for Configuring SCU on page 4](#)

Overview of Source Class Usage

Source class usage (SCU) is a logical extension of the destination class usage (DCU) concept. DCU was created so that Juniper Networks customers could count on a per-interface basis how much traffic was sent to specified prefixes. [Figure 1 on page 3](#) shows a service provider edge (PE) router diagram.

Figure 1: DCU/SCU Concept



The Fast Ethernet interfaces contain inbound traffic from customers, and the SONET/SDH interfaces are connected to outbound public network prefixes. With DCU configured on the Fast Ethernet interfaces, you can track how much traffic is sent to a specific prefix in the core of the network originating from one of the specified interfaces (in this case, the Fast Ethernet interfaces).

However, DCU limits your ability to keep track of traffic moving in the reverse direction. It can account for all traffic that arrives on a core interface and heads toward a specific customer, but it cannot count traffic that arrives on a core interface from a specific prefix. For example, DCU can process cumulative traffic headed toward interface **fe-0/0/0**, but cannot differentiate between traffic coming only from **10.3.0.0/16** and traffic coming from all prefixes.

You can track source-based traffic by using SCU, which allows you to monitor the amount of traffic originating from a specific prefix. With this feature, usage can be tracked and customers can be billed for the traffic they receive.

**Related
Documentation**

- [Source Class Usage Feature Guide](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU on page 13](#)
- [Roadmap for Configuring SCU with Layer 3 VPNs on page 13](#)
- [Example: SCU Configuration on page 25](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

Guidelines for Configuring SCU

When you enable SCU or DCU, keep the following information in mind:

- In Junos OS Release 5.6 and later for M Series routers only, you can use a source class or a destination class as a match condition in a firewall filter. To configure, include the **destination-class** or **source-class** statement at the **[edit firewall filter *firewall-name* term *term-name* from]** hierarchy level. For more information about firewall filters, see the *Junos Policy Framework Configuration Guide*.
- You can assign up to 126 source classes and 126 destination classes.
- When configuring policy action statements, you can configure only one source class for each matching route. In other words, more than one source class cannot be applied to the same route.
- A source or destination class is applied to a packet only once during the routing table lookup. When a network prefix matches a class-usage policy, SCU is assigned to packets first; DCU is assigned only if SCU has not been assigned. Be careful when using both class types, since misconfiguration can result in uncounted packets. The following example explores one potential mishap:

A packet arrives on a router interface configured for both SCU and DCU. The packet's source address matches an SCU class, and its destination matches a DCU class. Consequently, the packet is subjected to a source lookup and is marked with the SCU class. The DCU class is ignored. As a result, the packet is forwarded to the outbound interface with only the SCU class still intact.

However, the outbound interface lacks an SCU configuration. When the packet is ready to leave the router, the router detects that the output interface is not configured for SCU and the packet is not counted by SCU. Likewise, even though the prefix matched the DCU prefix, the DCU counters do not increment because DCU was superseded by SCU at the inbound interface.

To solve this problem, make sure you configure both the inbound and outbound interfaces completely or configure only one class type per interface per direction.

- Classes cannot be mapped to directly connected prefixes configured on local interfaces. This is true for DCU and SCU classes.
- If you use multiple terms within a single policy, you only need to configure the policy name and apply it to the forwarding table once. This makes it easier to change options within your terms without having to reconfigure the main policy.
- Execute command line interface (CLI) **show** commands and accounting profiles at the desired outbound interface to track SCU traffic. SCU counters increment at the SCU **output** interface.
- Apply your classes to the inbound and outbound interfaces by means of the **input** and **output** SCU interface parameters.
- On M320 and T Series routers, the source and destination classes are not carried across the platform fabric. For these routers, SCU and DCU accounting is performed before the packet enters the fabric and DCU is performed before output filters are evaluated.
- If an output filter drops traffic on M Series routers other than the M120 router and M320 router, the dropped packets are excluded from DCU statistics. If an output filter drops traffic on M320 and T Series routers, the dropped packets are included in DCU statistics.

**Related
Documentation**

- *Source Class Usage Feature Guide*
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU on page 13](#)
- [Example: SCU Configuration on page 25](#)

CHAPTER 2

System Requirements

- [System Requirements for SCU on page 7](#)

System Requirements for SCU

To implement SCU, your system must meet these requirements:

- Junos OS Release 8.2 or later for M120 and MX Series router support
- Junos OS Release 6.2 or later for IPv6 SCU
- Junos OS Release 5.6 or later to use a source class or a destination class as a match condition in a firewall filter
- Junos OS Release 5.4 or later for IPv4 SCU
- Three Juniper Networks M Series, MX Series, or T Series routers for basic SCU and five routers for SCU with Layer 3 VPNs. One router acts as a source class usage transit router, and the other routers are used to generate traffic or participate in the Layer 3 VPN.
- For M Series and T Series routers, a Tunnel Services PIC for SCU with Layer 3 VPNs

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [Roadmap for Configuring SCU on page 13](#)
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CHAPTER 3

Glossary

- [Terms and Acronyms for SCU on page 9](#)

Terms and Acronyms for SCU

D

destination address (DA)	The IP address of a device intended as the receiver for a packet. This address is included in the IP header and is the main address analyzed by the router during routing table lookups and DCU.
destination class usage (DCU)	A method of grouping certain types of traffic and monitoring these groups through CLI show commands, accounting profiles, or SNMP. DCU uses a destination address lookup when determining group membership. For more information about DCU, see the <i>Junos Policy Framework Configuration Guide</i> .

S

source address (SA)	The IP address of a device sending a packet. This address is included in the IP header and is analyzed by the router for a variety of services, including source-based filtering, policing, class of service (CoS), and SCU.
source class usage (SCU)	A method of grouping certain types of traffic and monitoring these groups through CLI show commands, accounting profiles, or SNMP. SCU uses a source address lookup when determining group membership. For more information about SCU, see the <i>Junos Policy Framework Configuration Guide</i> .
Related Documentation	<ul style="list-style-type: none">• Source Class Usage Feature Guide• Overview of Source Class Usage on page 3• Roadmap for Configuring SCU on page 13• Roadmap for Configuring SCU with Layer 3 VPNs on page 13

PART 2

Configuration

- [Configuration Overview on page 13](#)
- [Basic Configuration Steps on page 15](#)
- [Configuring SCU with Layer 3 VPNs on page 19](#)

CHAPTER 4

Configuration Overview

- [Roadmap for Configuring SCU on page 13](#)
- [Roadmap for Configuring SCU with Layer 3 VPNs on page 13](#)

Roadmap for Configuring SCU

To configure source class usage (SCU), you must:

1. Create a routing policy that includes prefix route filters that indicate the IPv4 or IPv6 source addresses to monitor. See [“Configuring Route Filters and Source Classes in a Routing Policy” on page 15](#).
2. Apply the filters to the forwarding table. See [“Applying the Policy to the Forwarding Table” on page 16](#).
3. Enable accounting on the inbound and outbound interfaces. See [“Enabling Accounting on Inbound and Outbound Interfaces” on page 16](#).

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Example: SCU Configuration on page 25](#)

Roadmap for Configuring SCU with Layer 3 VPNs

SCU can be implemented over regular interfaces; it is also used in combination with Layer 3 VPNs. When you view SCU traffic on an ingress provider edge (PE) router, use the standard procedure outlined in [“Roadmap for Configuring SCU” on page 13](#). However, when you enable packet counting for Layer 3 VPNs at the egress point of the MPLS tunnel, you need to take some additional steps, as follows:

1. Configure SCU on the virtual loopback tunnel (vt) interface of the egress PE router. See [“Configuring Input SCU on the vt Interface of the Egress PE Router” on page 19](#).
2. Map the SCU-enabled input interface of that router to the virtual routing and forwarding (VRF) instance. See [“Mapping the SCU-Enabled vt Interface to the VRF Instance” on page 20](#).

3. Configure SCU on the output interface of the egress router. See [“Configuring SCU on the Output Interface” on page 20](#).
4. Configure an accounting profile and associate the source class with that accounting profile. You can also specify the filename for the data capture, a class usage profile name, and an interval indicating how often you want the SCU information to be saved. See [“Associating an Accounting Profile with SCU Classes” on page 21](#).



NOTE: SCU is not supported over Layer 2 VPNs.

**Related
Documentation**

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

CHAPTER 5

Basic Configuration Steps

- [Configuring Route Filters and Source Classes in a Routing Policy on page 15](#)
- [Applying the Policy to the Forwarding Table on page 16](#)
- [Enabling Accounting on Inbound and Outbound Interfaces on page 16](#)

Configuring Route Filters and Source Classes in a Routing Policy

Begin configuring SCU by creating prefix route filters in a policy statement. These prefixes indicate the IPv4 or IPv6 source addresses to monitor. Within the policy statement, you must define and name the source classes attached to the filters.

```
[edit policy-options]
policy-statement policy-name {
  term term-name {
    from {
      route-filter address/prefix;
    }
    then source-class class-name;
  }
}
```



NOTE: When configuring policy action statements, you can configure only one source class for each matching route. In other words, more than one source class cannot be applied to the same route.

An alternate configuration method, using the **forwarding-class** policy action, is even more flexible. It allows your IPv4 or IPv6 route filters to apply to an SCU profile, a DCU profile, or both simultaneously. Additionally, if you have only one term, you can implement the **from** and **then** statements at the **[edit policy-options policy-statement *policy-name*]** hierarchy level.

```
[edit policy-options]
policy-statement policy-name {
  from {
    route-filter 105.15.0.0/16 orlonger;
  }
  then forwarding-class class-name;
}
```

A third option is the existing DCU parameter of **destination-class**. For more information on DCU, see the *Junos Policy Framework Configuration Guide*.

**Related
Documentation**

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU on page 13](#)
- [Example: SCU Configuration on page 25](#)

Applying the Policy to the Forwarding Table

Next, apply the policy you created to the forwarding table. When you apply the policy, the network prefixes you defined are marked with the appropriate source class.

```
[edit routing-options]
forwarding-table {
  export policy-name;
}
```

**Related
Documentation**

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU on page 13](#)
- [Example: SCU Configuration on page 25](#)

Enabling Accounting on Inbound and Outbound Interfaces

Unlike DCU, which only requires implementation on a single interface, accounting for SCU must be enabled on two interfaces: the inbound and outbound physical or logical interfaces traversed by the source class. You must define explicitly the two interfaces on which SCU monitored traffic is expected to arrive and depart. This is because SCU performs two lookups in the routing table: a source address (SA) and a destination address (DA) lookup. In contrast, DCU only has a single destination address lookup. By specifying the addresses involved in the additional SCU SA lookup, you minimize the performance impact on your router.

An individual SCU interface can be configured as an input interface, an output interface, or both. SCU can be enabled in an IPv4 (**family inet**) or IPv6 (**family inet6**) network. To configure SCU accounting, include the **source-class-usage** statement at the **[edit interfaces interface-name unit logical-unit-number family (inet | inet6) accounting]** hierarchy level:

```
[edit]
interfaces {
  interface-name {
    unit unit-number {
      family (inet | inet6) {
```

```
accounting {  
  source-class-usage {  
    (input | output | input output);  
  }  
  destination-class-usage;  
}  
}  
}
```

After the full SCU configuration is enabled, every packet arriving on an SCU input interface is subjected to an SA-based lookup and then a DA-based lookup. In addition, an individual set of counters for every configured SCU class is maintained by the router on a per-interface and per-protocol family basis.

**Related
Documentation**

- *Source Class Usage Feature Guide*
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
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CHAPTER 6

Configuring SCU with Layer 3 VPNs

- [Configuring Input SCU on the vt Interface of the Egress PE Router on page 19](#)
- [Mapping the SCU-Enabled vt Interface to the VRF Instance on page 20](#)
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- [Associating an Accounting Profile with SCU Classes on page 21](#)
- [Verifying Your SCU Accounting Profile on page 22](#)

Configuring Input SCU on the vt Interface of the Egress PE Router

To enable SCU in a Layer 3 VPN, configure source class usage on the virtual loopback tunnel (**vt**) interface of the egress PE router that is either configured for or equipped with a Tunnel PIC. The interface is equivalent to the inbound SCU interface, so use the **input** statement at the **[edit interfaces vt-interface-number unit 0 family inet accounting source-class-usage]** hierarchy level:

```
[edit]
interfaces {
  vt-0/3/0 {
    unit 0 {
      family inet {
        accounting {
          source-class-usage {
            input;
          }
        }
      }
    }
  }
}
```

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU with Layer 3 VPNs on page 13](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

Mapping the SCU-Enabled vt Interface to the VRF Instance

Next, include the VPN loopback tunnel interface in the desired VRF instance at the **[edit routing-instances *routing-instance-name*]** hierarchy level:

```
[edit]
routing-instances {
  routing-instance-name {
    instance-type vrf;
    interface at-2/1/1.0;
    interface vt-0/3/0.0;
    route-distinguisher 10.250.14.225:100;
    vrf-import import-policy-name;
    vrf-export export-policy-name;
    protocols {
      bgp {
        group to-r4 {
          local-address 10.20.253.1;
          peer-as 400;
          neighbor 10.20.253.2;
        }
      }
    }
  }
}
```

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU with Layer 3 VPNs on page 13](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

Configuring SCU on the Output Interface

Since VPN traffic enters the egress router through the VPN loopback tunnel interface, you still need to determine the exit interface for this traffic. To complete your SCU configuration, configure the output version of source class usage on the exit interface of your egress router:

```
[edit interfaces]
at-1/1/0 {
  unit 0 {
    family inet {
      accounting {
        source-class-usage {
          output;
        }
      }
    }
  }
}
```

```
}

```

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Roadmap for Configuring SCU with Layer 3 VPNs on page 13](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

Associating an Accounting Profile with SCU Classes

Once your source classes are defined, implemented on the inbound and outbound interfaces, and applied to the forwarding table, you are ready to associate the source class with an accounting profile. Configure the accounting profile at the **[edit accounting-options class-usage-profile]** hierarchy level. You can associate either an SCU source class or a DCU destination class with the accounting profile. You can also specify the filename for the data capture, a class usage profile name, and an interval (in minutes) indicating how often you want the SCU information to be saved to the file.

```
[edit]
accounting-options {
  file filename;
  class-usage-profile profile-name {
    file filename;
    interval minutes;
    source-classes {
      source-class-name;
    }
    destination-classes {
      destination-class-name;
    }
  }
}
```



NOTE: SCU accounting occurs on the outbound interface before output filter processing. If an SCU-marked packet is discarded in the router, the SCU counters can indicate more traffic than actually exists. You must use filter counters or traceoptions logs to ensure that all packets dropped by the SCU filter are recorded. If logged, you can subtract the discarded packets from the SCU counter tallies and calculate the true traffic profile.

Because DCU accounting occurs after the filtering process, DCU is unaffected by this disclaimer.

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)

- [Roadmap for Configuring SCU with Layer 3 VPNs on page 13](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

Verifying Your SCU Accounting Profile

Purpose To view the results of the SCU accounting profile you created.

Action Navigate to the `/var/log` directory of your router. It should contain the designated class usage profile log. The layout of an SCU profile looks like this:

`profile_name,epoch-timestamp,interface-name,source-class-name,packet-count,byte-count`

An example of the actual output from a profile looks like this:

```
scu_profile,980313078,ge-1/0/0.0,gold,82,6888
scu_profile,980313078,ge-1/0/0.0,silver,164,13776
scu_profile,980313078,ge-1/0/0.0,bronze,0,0
scu_profile,980313678,ge-1/0/0.0,gold,82,6888
scu_profile,980313678,ge-1/0/0.0,silver,246,20664
scu_profile,980313678,ge-1/0/0.0,bronze,0,0
```

To view the parameters of your SCU accounting profile, you can use the **show accounting-options class-usage-profile *scu-profile-name*** command.

Related Documentation

- [Source Class Usage Feature Guide](#)
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)
- [Associating an Accounting Profile with SCU Classes on page 21](#)

PART 3

Examples

- [Examples on page 25](#)

CHAPTER 7

Examples

- [Example: SCU Configuration on page 25](#)
- [Example: SCU with Layer 3 VPNs Configuration on page 33](#)

Example: SCU Configuration

- [Example: SCU Configuration on page 25](#)
- [Verifying Your Work on page 28](#)

Example: SCU Configuration

Figure 2: SCU Topology Diagram

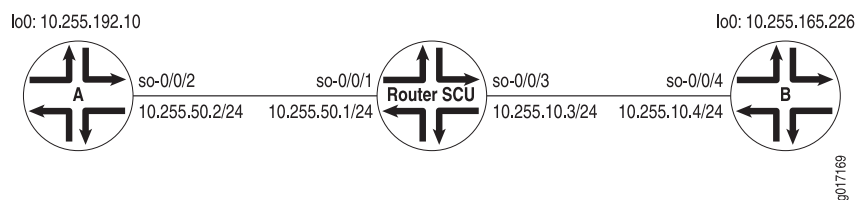


Figure 2 on page 25 shows a basic SCU configuration with three routers. Source routers A and B use loopback addresses as the prefixes to be monitored. Most of the configuration tasks and actual monitoring occurs on transit Router SCU.

Begin your configuration on Router A. The loopback address on Router A contains the origin of the prefix that is to be assigned to source class A on Router SCU. However, no SCU processing happens on this router. Therefore, configure Router A for basic OSPF routing and include your loopback interface and interface **so-0/0/2** in the OSPF process.

```
Router A: [edit]
interfaces {
  so-0/0/2 {
    unit 0 {
      family inet {
        address 10.255.50.2/24;
      }
    }
  }
  lo0 {
    unit 0 {
      family inet {
```

```
        address 10.255.192.10/32;
    }
}
}
protocols {
    ospf {
        area 0.0.0.0 {
            interface so-0/0/2.0;
            interface lo0.0;
        }
    }
}
```

Router SCU handles the bulk of the activity in this example. On Router SCU, enable source class usage on the inbound and outbound interfaces at the **[edit interfaces *interface-name* unit *unit-number* family inet accounting]** hierarchy level. Make sure you specify the expected traffic: input, output, or, in this case, both.

Next, configure a route filter policy statement that matches the prefixes of the loopback addresses from routers A and B. Include statements in the policy that classify packets from Router A in one group named **scu-class-a** and packets from Router B in a second class named **scu-class-b**. Notice the efficient use of a single policy containing multiple terms.

Last, apply the policy to the forwarding table.

```
Router SCU [edit]
interfaces {
    so-0/0/1 {
        unit 0 {
            family inet {
                accounting {
                    source-class-usage {
                        input;
                        output;
                    }
                }
            }
            address 10.255.50.1/24;
        }
    }
    so-0/0/3 {
        unit 0 {
            family inet {
                accounting {
                    source-class-usage {
                        input;
                        output;
                    }
                }
            }
            address 10.255.10.3/24;
        }
    }
}
```



```

lo0 {
  unit 0 {
    family inet {
      address 10.255.6.111/32;
    }
  }
}
protocols {
  ospf {
    area 0.0.0.0 {
      interface so-0/0/1.0;
      interface so-0/0/3.0;
    }
  }
}
routing-options {
  forwarding-table {
    export scu-policy;
  }
}
policy-options {
  policy-statement scu-policy {
    term 0 {
      from {
        route-filter 10.255.192.0/24 orlonger;
      }
      then source-class scu-class-a;
    }
    term 1 {
      from {
        route-filter 10.255.165.0/24 orlonger;
      }
      then source-class scu-class-b;
    }
  }
}

```

Complete the configuration tasks on Router B. Just as Router A provides a source prefix, Router B's loopback address matches the prefix assigned to **scu-class-b** on Router SCU. Again, no SCU processing happens on this router, so configure Router B for basic OSPF routing and include your loopback interface and interface **so-0/0/4** in the OSPF process.

Router B: [edit]

```

interfaces {
  so-0/0/4 {
    unit 0 {
      family inet {
        address 10.255.10.4/24;
      }
    }
  }
}
lo0 {
  unit 0 {
    family inet {
      address 10.255.165.226/32;
    }
  }
}

```

```

    }
  }
}
protocols {
  ospf {
    area 0.0.0.0 {
      interface so-0/0/4.0;
      interface lo0.0;
    }
  }
}
}

```

Verifying Your Work

To verify that SCU is functioning properly, use the following commands:

- **show interfaces *interface-name* statistics**
- **show interfaces *interface-name* (extensive | detail)**
- **show route (extensive | detail)**
- **show interfaces source-class *source-class-name* *interface-name***
- **clear interface *interface-name* statistics**

You should always verify SCU statistics at the outbound SCU interface on which you configured the **output** statement. You can perform the following three steps to check the functionality of SCU:

1. Clear all counters on your SCU-enabled router and verify that they are empty.
2. Send a ping from one edge router to another edge router to generate SCU traffic across the SCU-enabled router.
3. Verify that the counters are incrementing correctly on the outbound interface.

The following section shows the output of these commands as used with the configuration example.

```
user@scu> clear interfaces statistics all
```

```
user@scu> show interfaces so-0/0/1.0 statistics
```

```

Logical interface so-0/0/1.0 (Index 4) (SNMP ifIndex 119)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470
Source class

```

	scu-class-a	0	Packets	Bytes
scu-class-b	0	0	0	

```

Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.255.50/24, Local: 10.255.50.1

```

```
user@scu> show interfaces so-0/0/3.0 statistics
```

```

Logical interface so-0/0/3.0 (Index 6) (SNMP ifIndex 113)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470
Source class

```

	Packets	Bytes

```

scu-class-a                                0                0
scu-class-b                                0                0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.255.10/24, Local: 10.255.10.3

user@scu> show interfaces source-class scu-class-a so-0/0/3.0
Protocol inet
Source class                               Packets            Bytes
scu-class-a                               0                  0

user@scu> show interfaces source-class scu-class-b so-0/0/1.0
Protocol inet
Source class                               Packets            Bytes
scu-class-b                               0                  0

user@routerB> ping 10.255.192.10 source 10.255.165.226 rapid 10000

user@routerA> ping 10.255.165.226 source 10.255.192.10 rapid 10000

user@scu> show interfaces source-class scu-class-a so-0/0/3.0
Protocol inet
Source class                               Packets            Bytes
scu-class-a                               20000              1680000

user@scu> show interfaces source-class scu-class-a so-0/0/1.0
Protocol inet
Source class                               Packets            Bytes
scu-class-b                               20000              1680000

user@scu> show interfaces so-0/0/3.0 statistics
Logical interface so-0/0/3.0 (Index 6) (SNMP ifIndex 113)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470
Source class                               Packets            Bytes
scu-class-a                               20000              1680000
scu-class-b                               0                  0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.255.10/24, Local: 10.255.10.3

user@scu> show interfaces so-0/0/1.0 statistics
Logical interface so-0/0/1.0 (Index 4) (SNMP ifIndex 119)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470
Source class                               Packets            Bytes
scu-class-a                               0                  0
scu-class-b                               20000              1680000
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.255.50/24, Local: 10.255.50.1

user@scu> show route extensive 10.255.192.0

inet.0: 26 destinations, 28 routes (25 active, 0 holddown, 1 hidden)
10.255.192.0/18 (1 entry, 1 announced)
TSI:
KRT in-kernel 10.255.192.0/18 -> {so-0/0/1.0}
Source class: scu-class-a
*OSPF Preference: 150
Next hop: via so-0/0/1.0, selected
State: <Active Int Ext>

```

```

Age: 2:49:31 Metric: 0 Tag: 0
Task: OSPF
Announcement bits (1): 0-KRT
AS path: I

```

```

user@scu> show route extensive 10.255.165.0
inet.0: 26 destinations, 28 routes (25 active, 0 holddown, 1 hidden)
10.255.165.0/20 (1 entry, 1 announced)
TSI:
KRT in-kerne1 10.255.165.0/20 -> {so-0/0/3.0}
Source class: scu-class-b
  *OSPF Preference: 150
    Next hop: via so-0/0/3.0, selected
    State: <Active Int Ext>
    Age: 2:49:31 Metric: 0 Tag: 0
    Task: OSPF
    Announcement bits (1): 0-KRT
    AS path: I

```

```

user@scu> show interfaces so-0/0/1 detail
Physical interface: so-0/0/1, Enabled, Physical link is Up
  Interface index: 12, SNMP ifIndex: 17, Generation: 11
  Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
  Loopback: None, FCS: 16, Payload scrambler: Enabled
  Device flags   : Present Running
  Interface flags: Point-To-Point SNMP-Traps
  Link flags     : Keepalives
  Hold-times    : Up 0 ms, Down 0 ms
  Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
  Keepalive statistics:
    Input : 46 (last seen 00:00:01 ago)
    Output: 45 (last sent 00:00:00 ago)
  LCP state: Opened
  NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
  Not-configured
  CHAP state: Not-configured
  Last flapped : 2002-04-19 11:49:22 PDT (03:10:09 ago)
  Statistics last cleared: 2002-04-19 14:52:04 PDT (00:07:27 ago)
  Traffic statistics:
    Input bytes : 1689276 40 bps
    Output bytes: 1689747 48 bps
    Input packets: 20197 0 pps
    Output packets: 20200 0 pps
  Queue counters:

```

	Queued packets	Transmitted packets	Dropped packets
0 best-effort	20053	20053	0
1 expedited-fo	0	0	0
2 assured-forw	0	0	0
3 network-cont	146	146	0

```

  SONET alarms : None
  SONET defects : None
  Logical interface so-0/0/1.0 (Index 4) (SNMP ifIndex 119) (Generation 3)
  Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
  Protocol inet, MTU: 4470

```

```

Flags: SCU-in, SCU-out
Generation: 6 Route table: 0
Source class      Packets      Bytes
scu-class-a       0          0
scu-class-b      20000      1680000
Filters: Input: icmp-so-0/0/1.0-i, Output: icmp-so-0/0/1.0-o
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.255.50/24, Local: 10.255.50.1, Broadcast: Unspecified,
Generation: 8

```

user@scu> show interfaces so-0/0/1 extensive

```

Physical interface: so-0/0/1, Enabled, Physical link is Up
Interface index: 12, SNMP ifIndex: 17, Generation: 11
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC3,
Loopback: None, FCS: 16, Payload scrambler: Enabled
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 51 (last seen 00:00:04 ago)
  Output: 50 (last sent 00:00:05 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Not-configured, iso: Not-configured, mpls:
Not-configured
CHAP state: Not-configured
Last flapped   : 2002-04-19 11:49:22 PDT (03:11:05 ago)
Statistics last cleared: 2002-04-19 14:52:04 PDT (00:08:23 ago)
Traffic statistics:
  Input bytes :          1689884          264 bps
  Output bytes :          1690388          280 bps
  Input packets:           20215           0 pps
  Output packets:          20217           0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0,
  Bucket drops: 0, Policed discards: 0, L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0,
  HS link FIFO overflows: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0,
  HS link FIFO underflows: 0
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort          20053              20053                  0

  1 expedited-fo           0                  0                      0

  2 assured-forw           0                  0                      0

  3 network-cont          164              164                    0

SONET alarms   : None
SONET defects  : None
SONET PHY:
  PLL Lock      0          0 OK
  PHY Light     0          0 OK
SONET section:
  BIP-B1        0          0
  SEF           0          0 OK
  LOS           0          0 OK

```

```

LOF                                0          0 OK
ES-S                               0
SES-S                               0
SEFS-S                              0
SONET line:
BIP-B2                             0          0
REI-L                              0          0
RDI-L                              0          0 OK
AIS-L                              0          0 OK
BERR-SF                             0          0 OK
BERR-SD                             0          0 OK
ES-L                               0
SES-L                               0
UAS-L                               0
ES-LFE                             0
SES-LFE                             0
UAS-LFE                             0
SONET path:
BIP-B3                             0          0
REI-P                              0          0
LOP-P                              0          0 OK
AIS-P                              0          0 OK
RDI-P                              0          0 OK
UNEQ-P                             0          0 OK
PLM-P                              0          0 OK
ES-P                               0
SES-P                               0
UAS-P                               0
ES-PFE                             0
SES-PFE                             0
UAS-PFE                             0
Received SONET overhead:
F1      : 0x00, J0      : 0x00, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0xcf, C2(cmp) : 0xcf, F2      : 0x00
Z3      : 0x00, Z4      : 0x00, S1(cmp) : 0x00, V5      : 0x00
V5(cmp) : 0x00
Transmitted SONET overhead:
F1      : 0x00, J0      : 0x01, K1      : 0x00, K2      : 0x00
S1      : 0x00, C2      : 0xcf, F2      : 0x00, Z3      : 0x00
Z4      : 0x00, V5      : 0x00
Received path trace: e so-0/0/1
65 20 73 6f 2d 30 2f 30 2f 31 00 00 00 00 00 00 00 00  e so-0/0/1.....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 0d 0a  .....
Transmitted path trace: scu so-0/0/1
67 68 62 20 73 6f 2d 30 2f 30 2f 31 00 00 00 00 00  scu so-0/0/1....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00  .....
HDLC configuration:
Policing bucket: Disabled
Shaping bucket : Disabled
Giant threshold: 4484, Runt threshold: 3
Packet Forwarding Engine configuration:
Destination slot: 0, PLP byte: 1 (0x00)
CoS transmit queue      Bandwidth      Buffer      Priority      Limit
                        %      bps      %      bytes
0 best-effort            0          0  0          0      low      none
1 expedited-forwarding  0          0  0          0      low      none
2 assured-forwarding    0          0  0          0      low      none

```

```

3 network-control 0 0 0 0 low none
Logical interface so-0/0/1.0 (Index 4) (SNMP ifIndex 119) (Generation 3)
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
Protocol inet, MTU: 4470
Flags: SCU-in, SCU-out
Generation: 6 Route table: 0
Source class      Packets      Bytes
scu-class-a       0          0
scu-class-b      20000      1680000
Filters: Input: icmp-so-0/0/1.0-i, Output: icmp-so-0/0/1.0-o
Addresses, Flags: Is-Preferred Is-Primary
Destination: 10.255.50/24, Local: 10.255.50.1, Broadcast: Unspecified,
Generation: 8

```

- Related Documentation**
- [Source Class Usage Feature Guide](#)
 - [Overview of Source Class Usage on page 3](#)
 - [System Requirements for SCU on page 7](#)
 - [Roadmap for Configuring SCU on page 13](#)

Example: SCU with Layer 3 VPNs Configuration

- [Example: SCU in a Layer 3 VPN Configuration on page 33](#)
- [Verifying Your Work on page 40](#)

Example: SCU in a Layer 3 VPN Configuration

Figure 3: SCU in a Layer 3 VPN Topology Diagram

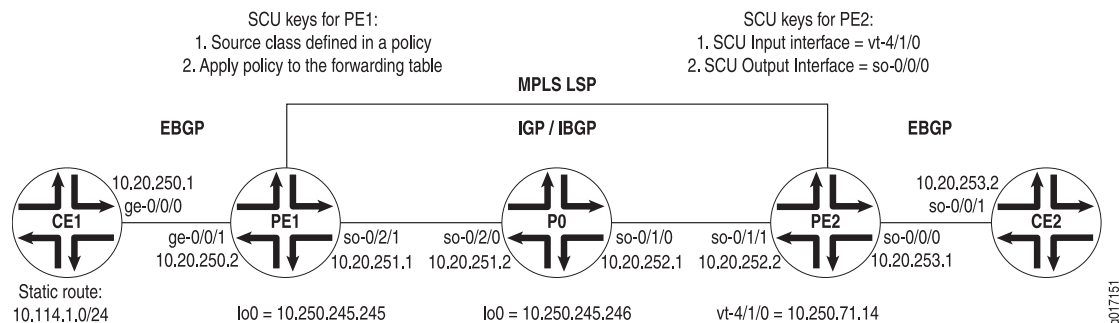


Figure 3 on page 33 displays a Layer 3 VPN topology. CE1 and CE2 are customer edge (CE) routers connected by a VPN through provider routers PE1, P0, and PE2. EBGP is established between routers CE1 and PE1, IBGP connects routers PE1 and PE2 over an IS-IS/MPLS/LDP core, and a second EBGP connection flows between routers PE2 and CE2.

On Router CE1, begin your VPN by setting up an EBGP connection to PE1. Install a static route of 10.114.1.0/24 and advertise this route to your EBGP neighbor.

```

Router CE1 [edit]
interfaces {
  ge-0/0/0 {
    unit 0 {

```

```
        family inet {
            address 10.20.250.1/30;
        }
    }
}
routing-options {
    static {
        route 10.114.1.0/24 reject;
    }
    autonomous-system 100;
}
protocols {
    bgp {
        group to-pe1 {
            local-address 10.20.250.1;
            export inject-direct;
            peer-as 300;
            neighbor 10.20.250.2;
        }
    }
}
policy-options {
    policy-statement inject-direct {
        term 1 {
            from {
                protocol static;
                route-filter 10.114.1.0/24 exact;
            }
            then accept;
        }
        term 2 {
            from protocol direct;
            then accept;
        }
    }
}
```

On PE1, complete the EBGp connection to CE1 through a VRF routing instance. Set an export policy for your VRF instance that puts BGP traffic into a community, and an import policy that accepts like community traffic from your VPN neighbor. Lastly, configure an IBGP relationship to Router PE2 that runs over an IS-IS, MPLS, and LDP core.

```
Router PE1 [edit]
interfaces {
    ge-0/0/1 {
        unit 0 {
            family inet {
                address 10.20.250.2/30;
            }
        }
    }
    so-0/2/1 {
        unit 0 {
            family inet {
                address 10.20.251.1/30;
            }
        }
    }
}
```



```

    }
    family iso;
    family mpls;
  }
}
lo0 {
  unit 0 {
    family inet {
      address 10.250.245.245/32;
    }
    family iso;
    family mpls;
  }
}
}
routing-options {
  autonomous-system 300;
}
protocols {
  mpls {
    interface so-0/2/1;
  }
  bgp {
    group ibgp {
      type internal;
      local-address 10.250.245.245;
      family inet-vpn {
        unicast;
      }
      neighbor 10.250.71.14;
    }
  }
  isis {
    interface so-0/2/1;
  }
  ldp {
    interface so-0/2/1;
  }
}
policy-options {
  policy-statement red-import {
    from {
      protocol bgp;
      community red-com;
    }
    then accept;
  }
  policy-statement red-export {
    from protocol bgp;
    then {
      community add red-com;
      accept;
    }
  }
  community red-com members target:20:20;
}

```

```
routing-instances {
  red {
    instance-type vrf;
    interface ge-0/0/1.0;
    route-distinguisher 10.250.245.245:100;
    vrf-import red-import;
    vrf-export red-export;
    protocols {
      bgp {
        group to-cel {
          local-address 10.20.250.2;
          peer-as 100;
          neighbor 10.20.250.1;
        }
      }
    }
  }
}
```

On P0, connect the IBGP neighbors located at PE1 and PE2. Remember to include VPN-related protocols (MPLS, LDP, and IGP) on all interfaces.

```
Router P0 [edit]
interfaces {
  so-0/1/0 {
    unit 0 {
      family inet {
        address 10.20.252.1/30;
      }
      family iso;
      family mpls;
    }
  }
  so-0/2/0 {
    unit 0 {
      family inet {
        address 10.20.251.2/30;
      }
      family iso;
      family mpls;
    }
  }
  lo0 {
    unit 0 {
      family inet {
        address 10.250.245.246/32;
      }
      family iso;
      family mpls;
    }
  }
}
routing-options {
  autonomous-system 300;
}
protocols {
```

```

mpls {
  interface so-0/1/0;
  interface so-0/2/0;
}
isis {
  interface all;
}
ldp {
  interface all;
}
}

```

On PE2, complete the IBGP relationship to Router PE1. Establish an EBGp connection to CE2 through a VRF routing instance. Set an export policy for the VRF instance that places BGP traffic into a community, and an import policy that accepts like community traffic from the VPN neighbor. Next, establish a policy that adds the static route from CE1 to a source class called **GOLD1**. Also, export this SCU policy into the forwarding table. Finally, set your **vt** interface as the SCU input interface and establish the CE-facing interface **so-0/0/0** as the SCU output interface.

```

Router PE2 [edit]
interfaces {
  so-0/1/1 {
    unit 0 {
      family inet {
        address 10.20.252.2/30;
      }
      family iso;
      family mpls;
    }
  }
  so-0/0/0 {
    unit 0 {
      family inet {
        accounting {
          source-class-usage {
            output;
          }
        }
        address 10.20.253.1/30;
      }
    }
  }
  vt-4/1/0 {
    unit 0 {
      family inet {
        accounting {
          source-class-usage {
            input;
          }
        }
        address 10.250.71.14/32;
      }
      family iso;
      family mpls;
    }
  }
}

```

```
    }
  }
}
routing-options {
  autonomous-system 300;
  forwarding-table {
    export inject-customer2-dest-class;
  }
}
protocols {
  mpls {
    interface so-0/1/1;
    interface vt-4/1/0;
  }
  bgp {
    group ibgp {
      type internal;
      local-address 10.250.71.14;
      family inet-vpn {
        unicast;
      }
      neighbor 10.250.245.245;
    }
  }
  isis {
    interface so-0/1/1;
  }
  ldp {
    interface so-0/1/1;
  }
}
routing-instances {
  red {
    instance-type vrf;
    interface so-0/0/0.0;
    interface vt-4/1/0.0;
    route-distinguisher 10.250.71.14:100;
    vrf-import red-import;
    vrf-export red-export;
    protocols {
      bgp {
        group to-ce2 {
          local-address 10.20.253.1;
          peer-as 400;
          neighbor 10.20.253.2;
        }
      }
    }
  }
}
policy-options {
  policy-statement red-import {
    from {
      protocol bgp;
      community red-com;
    }
  }
}
```

```

        then accept;
    }
    policy-statement red-export {
        from protocol bgp;
        then {
            community add red-com;
            accept;
        }
    }
    policy-statement inject-customer2-dest-class {
        term term-gold1-traffic {
            from {
                route-filter 10.114.1.0/24 exact;
            }
            then source-class GOLD1;
        }
    }
    community red-com members target:20:20;
}

```

On Router CE2, complete the VPN path by finishing the EBGp connection to PE2.

```

Router CE2 [edit]
interfaces {
    so-0/0/1 {
        unit 0 {
            family inet {
                address 10.20.253.2/30;
            }
        }
    }
}
routing-options {
    autonomous-system 400;
}
protocols {
    bgp {
        group to-pe2 {
            local-address 10.20.253.2;
            export inject-direct;
            peer-as 300;
            neighbor 10.20.253.1;
        }
    }
}
policy-options {
    policy-statement inject-direct {
        from {
            protocol direct;
        }
        then accept;
    }
}
}

```

Verifying Your Work

To verify that SCU is functioning properly in the Layer 3 VPN, use the following commands:

- **show interfaces *interface-name* statistics**
- **show interfaces source-class *source-class-name* *interface-name***
- **show interfaces *interface-name* (extensive | detail)**
- **show route (extensive | detail)**
- **clear interface *interface-name* statistics**

You should always verify SCU statistics at the outbound SCU interface on which you configured the **output** statement. To check SCU functionality, follow these steps:

1. Clear all counters on your SCU-enabled router and verify they are empty.
2. Send a ping from the ingress CE router to the second CE router to generate SCU traffic across the SCU-enabled VPN route.
3. Verify that the counters are incrementing correctly on the outbound interface.

The following section shows the output of these commands used with the configuration example.

```
user@pe2> clear interfaces statistics all
```

```
user@pe2> show interfaces so-0/0/0.0 statistics
```

```
Logical interface so-0/0/0.0 (Index 6) (SNMP ifIndex 113)
```

```
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
```

```
Protocol inet, MTU: 4470
```

Source class	Packets	Bytes
GOLD1 0 0		

```
Addresses, Flags: Is-Preferred Is-Primary
```

```
user@pe2> show interfaces source-class GOLD1 so-0/0/0.0
```

```
Protocol inet
```

Source class	Packets	Bytes
GOLD1 0 0		

```
user@ce1> ping 10.20.253.2 source 10.114.1.1 rapid count 10000
```

```
user@scu> show interfaces source-class GOLD1 so-0/0/0.0
```

```
Protocol inet
```

Source class	Packets	Bytes
GOLD1 20000 1680000		

```
user@scu> show interfaces so-0/0/0.0 statistics
```

```
Logical interface so-0/0/0.0 (Index 6) (SNMP ifIndex 113)
```

```
Flags: Point-To-Point SNMP-Traps Encapsulation: PPP
```

```
Protocol inet, MTU: 4470
```

Source class	Packets	Bytes
GOLD1 20000 1680000		

```
Addresses, Flags: Is-Preferred Is-Primary  
Destination: 10.20.253/24, Local: 10.20.253.1
```

**Related
Documentation**

- *Source Class Usage Feature Guide*
- [Overview of Source Class Usage on page 3](#)
- [System Requirements for SCU on page 7](#)

PART 4

Administration

- [Commands on page 45](#)

CHAPTER 8

Commands

clear interfaces statistics

Syntax	clear interfaces statistics (all | <i>interface-name</i>)
Release Information	Command introduced before Junos OS Release 7.4.
Description	Set interface statistics to zero. If you issue the clear interfaces statistics <i>interface-name</i> command and then perform a graceful Routing Engine switchover, the interface statistics are not cleared on the new master. Reissue the command to clear the interface statistics again.
Options	all —Set statistics on all interfaces to zero. <i>interface-name</i> —Set statistics on a particular interface to zero.
Required Privilege Level	clear
List of Sample Output	clear interfaces statistics on page 46
Output Fields	When you enter this command, you are provided feedback on the status of your request.

Sample Output

clear interfaces statistics

```
user@host> clear interfaces statistics
```

show accounting profile

Syntax	<code>show accounting profile <i>profile-name</i></code>
Release Information	Command introduced before Junos OS Release 7.4.
Description	Display accounting profile information.
Options	<i>profile-name</i> —Name of the accounting profile.
Required Privilege Level	view
List of Sample Output	show accounting profile (Interface) on page 48 show accounting profile (Filter) on page 49 show accounting profile (Destination Class) on page 49 show accounting profile (Routing Engine) on page 50
Output Fields	Table 3 on page 47 lists the output fields for the show accounting profile command. Output fields are listed in the approximate order in which they appear.

Table 3: show accounting profile Output Fields

Field Name	Field Description
Profile	Name of the accounting profile.
Sampling interval	Configured interval, in minutes, for statistic collection.
Profile Usage Count	Number of items configured for collecting accounting statistics.
<i>file information</i>	Information about the accounting profile log, including: <ul style="list-style-type: none"> • File—Name of accounting profile log. If no name is explicitly provided, the name of the accounting profile is used. All statistics files are placed in the <code>/var/log</code> directory. • maximum size—Configured size. When the size is exceeded, the log file closes and a new log file opens. • maximum number—Configured maximum number of log files. • bytes written—Number of bytes written to the log file.
Transfer Interval	Length of time (in minutes) the file remains open, receiving statistics before it is closed, transferred, and rotated. When either the time or the file size is exceeded, the file is closed and a new one opened, whether or not a transfer site is specified.
Next Scheduled Transfer	Time at which the next transfer occurs.

Table 3: show accounting profile Output Fields (*continued*)

Field Name	Field Description
Column Labels	<p>Names of sampled statistics. This list varies depending on the configuration:</p> <ul style="list-style-type: none"> profile-layout—List of data fields reported, in the order they appear in the output. epoch-timestamp—Number of seconds since the epoch. interfaces—(For interface, filter, and destination class profiles) Name of the interfaces on which the filter is applied. filter-name—(For filter profiles) Name of the filter. counter-name—(For filter profiles) Name of the counter. packet-count—(For filter and destination class profiles) Number of packets for the counter. byte-count—(For filter and destination class profiles) Number of bytes for the counter. input-bytes—(For interface profiles) Input bytes. input-errors—(For interface profiles) Generic input error packets. input-multicast—(For interface profiles) Input packets arriving by multicast. input-packets—(For interface profiles) Input packets. input-unicast—(For interface profiles) Input unicast packets. output-bytes—(For interface profiles) Output bytes. output-errors—(For interface profiles) Generic output error packets. output-multicast—(For interface profiles) Output packets sent by multicast. output-packets—(For interface profiles) Output packets. output-unicast—(For interface profiles) Output unicast packets. no-proto—(For interface profiles) Packets for unsupported protocol. snmp-index—(For interface profiles) SNMP index. destination-class-name—(For destination class profiles) Configured destination class name. host name—(For Routing Engine profiles) Hostname for the router. date-yyyyymmdd—(For Routing Engine profiles) Date. timeofday-hhmmss—(For Routing Engine profiles) Time of day. uptime—(For Routing Engine profiles) Time since the last reboot, in seconds. cpu1min—(For Routing Engine profiles) Average system load over the last 1 minute. cpu5min—(For Routing Engine profiles) Average system load over the last 5 minutes. cpu15min—(For Routing Engine profiles) Average system load over the last 15 minutes.
Interface name	Name of the interface configured for this accounting profile.
Filter name	Name of the filter configured for this accounting profile.
routing-engine-stats	Routing Engine accounting profile.
Next Scheduled Collection	Time for next collection of statistics for the named interface.

Sample Output

show accounting profile (Interface)

```
user@host> show accounting profile if_prof
```

```

Profile if_prof
Sampling interval: 1 minute(s), Profile Usage Count: 2
File accounting_profile_stats: maximum size 1048576, maximum number 5, bytes
written 2196
Transfer Interval: 15 minute(s), Next Scheduled Transfer: 2001-06-17-18:00:45
Column Labels:
  profile-layout
  epoch-timestamp
  interface-name
  snmp-index
  input-bytes
  output-bytes
  input-packets
  output-packets
  input-unicast
  output-unicast
  input-multicast
  output-multicast
  no-proto
  input-errors
  output-errors

```

Interface Name	Next Scheduled Collection
fxp0.0	2001-06-18-18:00:30
fxp0	2001-06-18-18:01:00

show accounting profile (Filter)

```

user@host> show accounting profile filter_profile
Profile filter_profile
Sampling interval: 1 minute(s), Profile Usage Count: 0
File accounting_profile_stats: maximum size 1048576, maximum number 5, bytes
written 822
Transfer Interval: 15 minute(s), Next Scheduled Transfer: 2001-06-17-18:00:46
Column Labels:
  profile-layout
  epoch-timestamp
  interfaces
  filter-name
  counter-name
  packet-count
  byte-count

```

Filter Name	Next Scheduled Collection
myfiltero	2001-06-03-04:32:59

show accounting profile (Destination Class)

```

user@host> show accounting profile dcu1
Profile dcu1
Sampling interval: 1 minute(s), Profile Usage Count: 0
File accounting_profile_stats: maximum size 1048576, maximum number 5, bytes
written 901
Transfer Interval: 15 minute(s), Next Scheduled Transfer: 2001-06-17-18:00:46
Column Labels:
  profile-layout
  epoch-timestamp
  interface-name

```

```
destination-class-name
packet-count
byte-count
```

Interface Name	Next Scheduled Collection
so-0/3/3	2001-06-03-04:34:00

show accounting profile (Routing Engine)

```
user@host> show accounting profile rep1
Profile rep1
Sampling interval: 1 minute(s), Profile Usage Count: 1
File accounting_profile_stats: maximum size 1048576, maximum number 5, bytes
written 901
Transfer Interval: 15 minute(s), Next Scheduled Transfer: 2001-06-17-18:00:46
Column Labels:
  profile-layout
  epoch-timestamp
  hostname
  date-yyyyymmdd
  timeofday-hhmmss
  uptime
  cpu1min
  cpu5min
  cpu15min
```

Interface Name	Next Scheduled Collection
routing-engine-stats	2001-06-18-18:02:31

show interfaces source-class

Syntax	<code>show interfaces source-class</code> (all | <i>destination-class-name</i> <i>logical-interface-name</i>)
Release Information	Command introduced before Junos OS Release 7.4. all option introduced in Junos OS Release 8.0.
Description	Display information about interfaces grouped by source class.
Options	<p>all—Display information about all configured source classes.</p> <p>source-class-name—Name of a logical grouping of prefixes that count packets having the source address matching those prefixes.</p> <p>interface-name—Name of a logical interface.</p>
Additional Information	For interfaces that carry IPv4, IPv6, or Multiprotocol Label Switching (MPLS) traffic, you can maintain packet counts based on the entry and exit points for traffic passing through your network. Entry and exit points are identified by source and destination prefixes grouped into sets defined as source classes and destination classes. For more information, see the <i>Junos OS Network Interfaces Library for Routing Devices</i> .
Required Privilege Level	view
List of Sample Output	show interfaces source-class all on page 52
Output Fields	Table 4 on page 51 lists the output fields for the show interfaces source-class command. Output fields are listed in the approximate order in which they appear.

Table 4: show interfaces source-class Output Fields

Field Name	Field Description
Logical interface	Name of the logical interface.
Source class	Source class usage (SCU) counters per class for this interface.
Packets	Packets going to designated user-selected prefixes.
Bytes	Bytes going to designated user-selected prefixes.

Sample Output

show interfaces source-class all

```
user@host> show interfaces source-class all
```

```
Logical interface .local..1
```

```
Logical interface .local..2
```

```
Logical interface fxp0.0
```

```
Logical interface fxp1.0
```

```
Logical interface lo0.16384
```

```
Logical interface lo0.16385
```

```
Logical interface lo0.0
```

```
Logical interface .local..3
```

```
Logical interface .local..4
```

```
Logical interface .local..5
```

```
Logical interface .local..6
```

```
Logical interface .local..7
```

```
Logical interface .local..8
```

```
Logical interface .local..9
```

```
Logical interface .local..10
```

```
Logical interface lo0.3
```

```
Logical interface pfh-0/0/0.16383
```

```
Logical interface fe-0/1/0.0
```

```
Logical interface fe-0/1/1.0
```

```
Protocol inet
```

Source class	Packets (packet-per-second)	Bytes (bits-per-second)
GOLD1	0	0
(	0)	0)
GOLD2	0	0
(	0)	0)
GOLD3	0	0
(	0)	0)
v4-src	0	0
(	0)	0)

```
Protocol inet6
```

Source class	Packets (packet-per-second)	Bytes (bits-per-second)
GOLD1	0	0
(	0)	0)
GOLD2	0	0

```

                                (                0) (                0)
                                GOLD3           0                0
                                (                0) (                0)
                                v4-src           0                0
                                (                0) (                0)

Logical interface fe-0/1/2.0
  Description: CE1-to-PE2

Logical interface ge-0/3/0.0
  Description: CE1-to-PE1

Logical interface ge-0/3/2.0
  Description: CE2-to-PE1

Logical interface pc-0/3/0.16383

Logical interface lt-1/2/0.3
  Description: LS3->LS2

Logical interface lt-1/2/0.5
  Description: LS3->LS1

Logical interface sp-1/2/0.16383

```

show interfaces statistics

Syntax	<code>show interfaces statistics <i>interface-name</i> <detail></code>
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 12.1x48 for PTX Series Packet Transport Routers. Command introduced in Junos OS Release 12.2 for ACX Series Routers.
Description	Display static interface statistics, such as errors.
Options	<i>interface-name</i> —Name of an interface. <i>detail</i> —(Optional) Display detailed output.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• clear interfaces statistics on page 46
List of Sample Output	show interfaces statistics (Fast Ethernet) on page 54 show interfaces statistics (Gigabit Ethernet PIC—Egress) on page 55 show interfaces statistics detail (Aggregated Ethernet) on page 57 show interfaces statistics detail (Aggregated Ethernet—Ingress) on page 58 show interfaces statistics detail (Aggregated Ethernet—Egress) on page 59 show interfaces statistics (SONET/SDH) on page 61 show interfaces statistics (Aggregated SONET/SDH—Ingress) on page 62 show interfaces statistics (Aggregated SONET/SDH—Egress) on page 63 show interfaces statistics (PTX Series Packet Transport Routers) on page 64 show interfaces statistics (ACX Series routers) on page 64
Output Fields	Output from both the <code>show interfaces <i>interface-name</i> detail</code> and the <code>show interfaces <i>interface-name</i> extensive</code> commands include all the information displayed in the output from the <code>show interfaces statistics</code> command. For more information, see the particular interface type in which you are interested. For information about destination class and source class statistics, see the “Destination Class Field” section and the “Source Class Field” section under <i>Common Output Fields Description</i> . For information about the input errors and output errors, see <i>Fast Ethernet and Gigabit Ethernet Counters</i> .

Sample Output

show interfaces statistics (Fast Ethernet)

```
user@host> show interfaces fe-1/3/1 statistics
Physical interface: fe-1/3/1, Enabled, Physical link is Up
Interface index: 144, SNMP ifIndex: 1042
Description: ford fe-1/3/1
Link-level type: Ethernet, MTU: 1514, Speed: 100mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Enabled
Device flags   : Present Running
```

```

Interface flags: SNMP-Traps Internal: 0x4000
CoS queues      : 4 supported, 4 maximum usable queues
Current address: 00:90:69:93:04:dc, Hardware address: 00:90:69:93:04:dc
Last flapped    : 2006-04-18 03:08:59 PDT (00:01:24 ago)
Statistics last cleared: Never
Input rate      : 0 bps (0 pps)
Output rate     : 0 bps (0 pps)
Input errors: 0, Output errors: 0
Active alarms   : None
Active defects  : None
Logical interface fe-1/3/1.0 (Index 69) (SNMP ifIndex 50)
  Flags: SNMP-Traps Encapsulation: ENET2
  Protocol inet, MTU: 1500
    Flags: Is-Primary, DCU, SCU-in

      Destination class      Packets      Bytes
                        (packet-per-second) (bits-per-second)
                        silver1      0      0
                        (      0) (      0)
                        silver2      0      0
                        (      0) (      0)
                        silver3      0      0
                        (      0) (      0)
Addresses, Flags: Is-Default Is-Preferred Is-Primary
  Destination: 10.27.245/24, Local: 10.27.245.2,
  Broadcast: 10.27.245.255
  Protocol iso, MTU: 1497
  Flags: Is-Primary

```

show interfaces statistics (Gigabit Ethernet PIC—Egress)

```

user@host> show interfaces ge-5/2/0 statistics detail
Physical interface: ge-5/2/0, Enabled, Physical link is Up
  Interface index: 146, SNMP ifIndex: 519, Generation: 149
  Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps, BPDU Error: None,
  MAC-REWRITE Error: None, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Hold-times     : Up 0 ms, Down 0 ms
  Current address: 00:1d:b5:61:d9:74, Hardware address: 00:1d:b5:61:d9:74
  Last flapped   : 2009-11-11 11:24:00 PST (09:23:08 ago)
  Statistics last cleared: 2009-11-11 17:50:58 PST (02:56:10 ago)
  Traffic statistics:
    Input bytes :      271524      0 bps
    Output bytes :    37769598    352 bps
    Input packets:       3664      0 pps
    Output packets:    885790      0 pps
  IPv6 transit statistics:
    Input bytes :           0
    Output bytes :    16681118
    Input packets:           0
    Output packets:    362633
  Multicast statistics:
    IPv4 multicast statistics:
      Input bytes :      112048      0 bps
      Output bytes :    20779920      0 bps
      Input packets:       1801      0 pps
      Output packets:    519498      0 pps

```

```

IPv6 multicast statistics:
  Input bytes :          156500          0 bps
  Output bytes :         16681118        0 bps
  Input packets:           1818          0 pps
  Output packets:        362633          0 pps
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runt: 0, Policed discards: 0, L3
incompletes: 0, L2 channel errors: 0,
  L2 mismatch timeouts: 0, FIFO errors: 0, Resource errors: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Collisions: 0, Aged packets: 0,
FIFO errors: 0, HS link CRC errors: 0, MTU errors: 0,
  Resource errors: 0
Egress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort          882558          882558          0
  1 expedited-fo           0              0              0
  2 assured-forw          0              0              0
  3 network-cont         3232          3232          0

Active alarms : None
Active defects : None

Logical interface ge-5/2/0.0 (Index 71) (SNMP ifIndex 573) (Generation 135)
Flags: SNMP-Traps 0x4000 Encapsulation: ENET2
Egress accounting overhead: 100
Ingress accounting overhead: 90
Traffic statistics:
  Input bytes :          271524
  Output bytes :         37769598
  Input packets:           3664
  Output packets:        885790
IPv6 transit statistics:
  Input bytes :           0
  Output bytes :         16681118
  Input packets:           0
  Output packets:        362633
Local statistics:
  Input bytes :          271524
  Output bytes :         308560
  Input packets:           3664
  Output packets:         3659
Transit statistics:
  Input bytes :           0          0 bps
  Output bytes :        37461038        0 bps
  Input packets:           0          0 pps
  Output packets:        882131          0 pps
IPv6 transit statistics:
  Input bytes :           0
  Output bytes :         16681118
  Input packets:           0
  Output packets:        362633
Multicast statistics:
IPv4 multicast statistics:
  Input bytes :          112048          0 bps
  Output bytes :        20779920        0 bps
  Input packets:           1801          0 pps

```

```

Output packets:          519498          0 pps
IPV6 multicast statistics:
Input bytes :            156500          0 bps
Output bytes :           16681118        0 bps
Input packets:           1818           0 pps
Output packets:          362633          0 pps
Protocol inet, MTU: 1500, Generation: 151, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 40.40.40.0/30, Local: 40.40.40.2, Broadcast: 40.40.40.3,
Generation: 167
Protocol inet6, MTU: 1500, Generation: 152, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: ::40.40.40.0/126, Local: ::40.40.40.2
Generation: 169
Addresses, Flags: Is-Preferred
Destination: fe80::/64, Local: fe80::21d:b5ff:fe61:d974
Protocol multiservice, MTU: Unlimited, Generation: 171
Generation: 153, Route table: 0
Policer: Input: __default_arp_policer__

```

show interfaces statistics detail (Aggregated Ethernet)

```

user@host> show interfaces ae0 detail
Physical interface: ae0, Enabled, Physical link is Up
Interface index: 186, SNMP ifIndex: 111, Generation: 187
Link-level type: Ethernet, MTU: 1514, Speed: 2000mbps, Loopback: Disabled,
Source filtering: Disabled, Flow control: Disabled, Minimum links needed: 1,
Minimum bandwidth needed: 0
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Current address: 00:90:69:0b:2f:f0, Hardware address: 00:90:69:0b:2f:f0
Last flapped : Never
Statistics last cleared: 2006-12-23 03:04:16 PST (01:16:24 ago)
Traffic statistics:
Input bytes :            28544          0 bps
Output bytes :            39770          0 bps
Input packets:             508          0 pps
Output packets:            509          0 pps
Input bytes :            IPv6 28544
Output bytes :            IPv6 0
Input packets:            IPv6 508
Output packets:            IPv6 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 ae0.0 (Index 67) (SNMP ifIndex 139) (Generation 145)
Flags: SNMP-Traps Encapsulation: ENET2
Statistics          Packets          pps          Bytes          bps
Bundle:
Input :              508              0          28544          0
Output:              509              0          35698          0
Link:
ge-3/3/8.0
Input :              508              0          28544          0
Output:              0              0              0          0
ge-3/3/9.0

```

```

      Input :          0          0          0          0
      Output:          0          0          0          0
      Marker Statistics:  Marker Rx      Resp Tx      Unknown Rx      Illegal Rx
      ge-3/3/8.0          0          0          0          0
      ge-3/3/9.0          0          0          0          0
      Egress queues: 8 supported, 8 in use
      Queue counters:      Queued packets      Transmitted packets      Dropped packets

      0 best-effort          0          0          0
      1 expedited-fo          0          0          0
      2 assured-forw          0          0          0
      3 network-cont          0          0          0

      Protocol inet, MTU: 1500, Generation: 166, Route table: 0
      Flags: None
      Addresses, Flags: Is-Preferred Is-Primary
      Destination: 10.1.1/24, Local: 10.1.1.1, Broadcast: 10.1.1.255,
      Generation: 159
      Protocol inet6, MTU: 1500, Generation: 163, Route table: 0
      Flags: Is-Primary
      Addresses, Flags: Is-Preferred
      Destination: fe80::/64, Local: fe80::206:5bff:fe05:c321,
      Broadcast: Unspecified, Generation: 161

```

show interfaces statistics detail (Aggregated Ethernet—Ingress)

```

user@host> show interfaces statistics detail ae0 | no-more
Physical interface: ae0, Enabled, Physical link is Up
  Interface index: 128, SNMP ifIndex: 504, Generation: 278
  Link-level type: Ethernet, MTU: 1514, Speed: 1Gbps, BPDU Error: None, MAC-REWRITE
  Error: None, Loopback: Disabled,
  Source filtering: Disabled, Flow control: Disabled, Minimum links needed: 1,
  Minimum bandwidth needed: 0
  Device flags   : Present Running
  Interface flags: SNMP-Traps Internal: 0x4000
  Current address: 00:1d:b5:61:db:f0, Hardware address: 00:1d:b5:61:db:f0
  Last flapped   : 2009-11-09 03:30:23 PST (00:01:28 ago)
  Statistics last cleared: 2009-11-09 03:26:18 PST (00:05:33 ago)
  Traffic statistics:
    Input bytes :          544009602          54761856 bps
    Output bytes :           3396          0 bps
    Input packets:          11826292          148809 pps
    Output packets:           42          0 pps
  IPv6 transit statistics:
    Input bytes :          350818604
    Output bytes :           0
    Input packets:          7626488
    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
  Ingress queues: 8 supported, 4 in use
  Queue counters:      Queued packets      Transmitted packets      Dropped packets

      0 best-effort          0          0          0

```



```

1 expedited-fo          0          0          0
2 assured-forw          0          0          0
3 network-cont          0          0          0

Egress queues: 8 supported, 4 in use
Queue counters:          Queued packets  Transmitted packets  Dropped packets

0 best-effort           21          21          0
1 expedited-fo          0          0          0
2 assured-forw          0          0          0
3 network-cont          451         451          0

Logical interface ae0.0 (Index 70) (SNMP ifIndex 574) (Generation 177)
Flags: SNMP-Traps 0x4000 Encapsulation: ENET2
Statistics          Packets          pps          Bytes          bps
Bundle:
  Input :      11826292      148809      544009602      54761856
  Output:         42         0          3396         0
Link:
  ge-5/2/0.0
  Input :      11826292      148809      544009602      54761856
  Output:         42         0          3396         0
Marker Statistics:  Marker Rx      Resp Tx      Unknown Rx      Illegal Rx
ge-5/2/0.0          0          0          0          0
Protocol inet, MTU: 1500, Generation: 236, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 30.30.30.0/30, Local: 30.30.30.2, Broadcast: 30.30.30.3,
Generation: 310
Protocol inet6, MTU: 1500, Generation: 237, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: ::30.30.30.0/126, Local: ::30.30.30.2
Generation: 312
Addresses, Flags: Is-Preferred
Destination: fe80::/64, Local: fe80::21d:b5ff:fe61:dbf0
Protocol multiservice, MTU: Unlimited, Generation: 314
Generation: 238, Route table: 0
Policer: Input: __default_arp_policer__

```

show interfaces statistics detail (Aggregated Ethernet—Egress)

```

user@host> show interfaces statistics detail ae0 | no-more
Physical interface: ae0, Enabled, Physical link is Up
Interface index: 128, SNMP ifIndex: 501, Generation: 319
Link-level type: Ethernet, MTU: 1514, Speed: 1Gbps, BPDU Error: None, MAC-REWRITE
Error: None, Loopback: Disabled,
Source filtering: Disabled, Flow control: Disabled, Minimum links needed: 1,
Minimum bandwidth needed: 0
Device flags : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Current address: 00:1f:12:c2:37:f0, Hardware address: 00:1f:12:c2:37:f0
Last flapped : 2009-11-09 03:30:24 PST (00:02:42 ago)
Statistics last cleared: 2009-11-09 03:26:42 PST (00:06:24 ago)
Traffic statistics:
Input bytes :          440          0 bps

```

```

Output bytes :          1047338120          54635848 bps
Input packets:           7              0 pps
Output packets:        22768200          148466 pps
IPv6 transit statistics:
  Input bytes :           288
  Output bytes :        723202616
  Input packets:          4
  Output packets:       15721796
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
Ingress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort              0              0              0
  1 expedited-fo             0              0              0
  2 assured-forw             0              0              0
  3 network-cont             0              0              0

Egress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort       201985796          201985796              0
  1 expedited-fo             0              0              0
  2 assured-forw             0              0              0
  3 network-cont         65              65              0

Logical interface ae0.0 (Index 72) (SNMP ifIndex 505) (Generation 204)
Flags: SNMP-Traps 0x4000 Encapsulation: ENET2
Statistics      Packets      pps      Bytes      bps
Bundle:
  Input :           7          0          440          0
  Output:        22768200    148466    1047338120    54635848
Link:
  ge-2/1/6.0
  Input :           7          0          440          0
  Output:        22768200    148466    1047338120    54635848
Marker Statistics:  Marker Rx      Resp Tx      Unknown Rx      Illegal Rx
ge-2/1/6.0          0              0              0              0
Protocol inet, MTU: 1500, Generation: 291, Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: 30.30.30.0/30, Local: 30.30.30.1, Broadcast: 30.30.30.3,
Generation: 420
  Protocol inet6, MTU: 1500, Generation: 292, Route table: 0
  Addresses, Flags: Is-Preferred Is-Primary
  Destination: ::/26, Local: ::30.30.30.1
Generation: 422
  Addresses, Flags: Is-Preferred
  Destination: fe80::/64, Local: fe80::21f:12ff:fec2:37f0
Protocol multiservice, MTU: Unlimited, Generation: 424

```

Generation: 293, Route table: 0
 Policer: Input: __default_arp_policer__

show interfaces statistics (SONET/SDH)

```

user@host> show interfaces statistics detail so-3/0/0 | no-more
Physical interface: so-3/0/0, Enabled, Physical link is Up
Interface index: 133, SNMP ifIndex: 538, Generation: 283
Link-level type: PPP, MTU: 4474, Clocking: Internal, SONET mode, Speed: OC192,
Loopback: None, FCS: 16, Payload scrambler: Enabled
Device flags   : Present Running
Interface flags: Point-To-Point SNMP-Traps Internal: 0x4000
Link flags     : Keepalives
Hold-times     : Up 0 ms, Down 0 ms
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Keepalive statistics:
  Input : 13 (last seen 00:00:04 ago)
  Output: 14 (last sent 00:00:02 ago)
LCP state: Opened
NCP state: inet: Opened, inet6: Opened, iso: Not-configured, mpls: Not-configured

CHAP state: Closed
PAP state: Closed
CoS queues   : 8 supported, 8 maximum usable queues
Last flapped : 2009-11-09 02:52:34 PST (01:12:39 ago)
Statistics last cleared: 2009-11-09 03:58:54 PST (00:06:19 ago)
Traffic statistics:
  Input bytes   :          2559160294          54761720 bps
  Output bytes  :           10640          48 bps
  Input packets:          55633975          148809 pps
  Output packets:           216           0 pps
IPv6 transit statistics:
  Input bytes   :          647922328
  Output bytes  :           0
  Input packets:          14085269
  Output packets:           0
Input errors:
  Errors: 0, Drops: 0, Framing errors: 0, Runts: 0, Giants: 0, Bucket drops:
0, Policed discards: 0, L3 incompletes: 0,
  L2 channel errors: 0, L2 mismatch timeouts: 0, HS link CRC errors: 0, HS link
FIFO overflows: 0
Output errors:
  Carrier transitions: 0, Errors: 0, Drops: 0, Aged packets: 0, HS link FIFO
underflows: 0, MTU errors: 0
Egress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

  0 best-effort          4              4              0
  1 expedited-fo         0              0              0
  2 assured-forw         0              0              0
  3 network-cont        213             213             0

SONET alarms   : None
SONET defects  : None

Logical interface so-3/0/0.0 (Index 72) (SNMP ifIndex 578) (Generation 182)
Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
Protocol inet, MTU: 4470, Generation: 244, Route table: 0

```

```

Addresses, Flags: Is-Preferred Is-Primary
Destination: 30.30.30.0/30, Local: 30.30.30.2, Broadcast: 30.30.30.3,
Generation: 322
Protocol inet6, MTU: 4470, Generation: 245, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: ::30.30.30.0/126, Local: ::30.30.30.2
Generation: 324
Addresses, Flags: Is-Preferred
Destination: fe80::/64, Local: fe80::2a0:a5ff:fe61:9264
Generation: 326

```

show interfaces statistics (Aggregated SONET/SDH—Ingress)

```

user@host> show interfaces statistics detail as0 | no-more
Physical interface: as0, Enabled, Physical link is Up
Interface index: 132, SNMP ifIndex: 534, Generation: 282
Link-level type: PPP, MTU: 4474, Speed: OC192, Minimum links needed: 1, Minimum
bandwidth needed: 0
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Last flapped   : 2009-11-09 03:45:53 PST (00:09:38 ago)
Statistics last cleared: 2009-11-09 03:48:17 PST (00:07:14 ago)
Traffic statistics:
Input bytes :          2969786332          54761688 bps
Output bytes :             11601              0 bps
Input packets:          64560636          148808 pps
Output packets:             225              0 pps
IPv6 transit statistics:
Input bytes :      2086013152
Output bytes :              0
Input packets:      45348114
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
Egress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

0 best-effort          3              3              0

1 expedited-fo          0              0              0

2 assured-forw          0              0              0

3 network-cont        222            222              0

Logical interface as0.0 (Index 71) (SNMP ifIndex 576) (Generation 179)
Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
Statistics      Packets      pps      Bytes      bps
Bundle:
Input :      64560550      148808      2969785300      54761688
Output:           139           0          10344           0
Link:
so-3/0/0.0
Input :      64560550      148808      2969785300      54761688

```

```

Output:          139          0          10344          0
Protocol inet, MTU: 4470, Generation: 240, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: 30.30.30.0/30, Local: 30.30.30.2, Broadcast: 30.30.30.3,
Generation: 316
Protocol inet6, MTU: 4470, Generation: 241, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
Destination: ::30.30.30.0/126, Local: ::30.30.30.2
Generation: 318
Addresses, Flags: Is-Preferred
Destination: fe80::/64, Local: fe80::2a0:a5ff:fe61:9264
Generation: 320

```

show interfaces statistics (Aggregated SONET/SDH—Egress)

```

user@host> show interfaces statistics detail as0 | no-more
Physical interface: as0, Enabled, Physical link is Up
Interface index: 132, SNMP ifIndex: 565, Generation: 323
Link-level type: PPP, MTU: 4474, Speed: OC192, Minimum links needed: 1, Minimum
bandwidth needed: 0
Device flags   : Present Running
Interface flags: SNMP-Traps Internal: 0x4000
Link flags     : Keepalives
Keepalive settings: Interval 10 seconds, Up-count 1, Down-count 3
Last flapped   : 2009-11-09 03:43:37 PST (00:12:48 ago)
Statistics last cleared: 2009-11-09 03:48:54 PST (00:07:31 ago)
Traffic statistics:
Input bytes   :          11198          392 bps
Output bytes  :      3101452132      54783448 bps
Input packets :          234          0 pps
Output packets:      67422937      148868 pps
IPv6 transit statistics:
Input bytes   :          5780
Output bytes  :      2171015678
Input packets :          72
Output packets:      47195993
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
Egress queues: 8 supported, 4 in use
Queue counters:      Queued packets  Transmitted packets      Dropped packets

0 best-effort          67422830          67422830          0

1 expedited-fo          0          0          0

2 assured-forw          0          0          0

3 network-cont          90          90          0

Logical interface as0.0 (Index 71) (SNMP ifIndex 548) (Generation 206)
Flags: Point-To-Point SNMP-Traps 0x4000 Encapsulation: PPP
Statistics      Packets      pps      Bytes      bps
Bundle:
Input :          144          0          10118          392
Output:      67422847      148868      3101450962      54783448
Link:

```

```

so-0/1/0.0
  Input :          144          0          10118          392
  Output:        67422847      148868      3101450962      54783448
Protocol inet, MTU: 4470, Generation: 295, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
  Destination: 30.30.30.0/30, Local: 30.30.30.1, Broadcast: 30.30.30.3,
Generation: 426
Protocol inet6, MTU: 4470, Generation: 296, Route table: 0
Addresses, Flags: Is-Preferred Is-Primary
  Destination: ::/26, Local: ::30.30.30.1
Generation: 428
Addresses, Flags: Is-Preferred
  Destination: fe80::/64, Local: fe80::2a0:a5ff:fe63:1d0a
Generation: 429

```

show interfaces statistics (PTX Series Packet Transport Routers)

```

user@host> show interfaces statistics em0
Physical interface: em0, Enabled, Physical link is Up
  Interface index: 8, SNMP ifIndex: 0
  Type: Ethernet, Link-level type: Ethernet, MTU: 1514, Speed: 1000mbps
  Device flags   : Present Running
  Interface flags: SNMP-Traps
  Link type      : Full-Duplex
  Current address: 00:80:f9:25:00:1b, Hardware address: 00:80:f9:25:00:1b
  Last flapped   : Never
  Statistics last cleared: Never
Input packets : 212620
Output packets: 71
  Input errors: 0, Output errors: 0

  Logical interface em0.0 (Index 3) (SNMP ifIndex 0)
  Flags: SNMP-Traps Encapsulation: ENET2
  Input packets : 212590
  Output packets: 71
  Protocol inet, MTU: 1500
  Flags: Is-Primary
  Addresses, Flags: Is-Default Is-Preferred Is-Primary
    Destination: 192.168.3/24, Local: 192.168.3.30,
    Broadcast: 192.168.3.255

```

show interfaces statistics (ACX Series routers)

```

user@host> show interfaces statistics ge-0/1/7
Physical interface: ge-0/1/7, Enabled, Physical link is Down
  Interface index: 151, SNMP ifIndex: 524
  Link-level type: Ethernet, Media type: Copper, MTU: 1514, Link-mode: Full-duplex,
  Speed: 1000mbps, BPDU Error: None, MAC-REWRITE Error: None, Loopback: Disabled,

  Source filtering: Disabled, Flow control: Enabled, Auto-negotiation: Enabled,
  Remote fault: Online
  Device flags   : Present Running Down
  Interface flags: Hardware-Down SNMP-Traps Internal: 0x0
  Link flags     : None
  CoS queues     : 8 supported, 8 maximum usable queues
  Current address: 84:18:88:c1:49:a3, Hardware address: 84:18:88:c1:49:a3
  Last flapped   : 2012-05-11 04:25:28 PDT (2d 20:23 ago)
  Statistics last cleared: 2012-05-13 23:07:23 PDT (01:41:25 ago)
  Input rate     : 0 bps (0 pps)
  Output rate    : 0 bps (0 pps)
  Input errors: 0, Output errors: 0

```

```
Active alarms : LINK  
Active defects : LINK  
Interface transmit statistics: Disabled
```

show route

Syntax	<code>show route</code> <code><all></code> <code><destination-prefix></code> <code><logical-system (all | <i>logical-system-name</i>)></code> <code><private></code>
Syntax (EX Series Switches)	<code>show route</code> <code><all></code> <code><destination-prefix></code> <code><private></code>
Release Information	Command introduced before Junos OS Release 7.4. Command introduced in Junos OS Release 9.0 for EX Series switches. Option private introduced in Junos OS Release 9.5. Option private introduced in Junos OS Release 9.5 for EX Series switches.
Description	Display the active entries in the routing tables.
Options	none —Display brief information about all active entries in the routing tables. all —(Optional) Display information about all routing tables, including private, or internal, routing tables. destination-prefix —(Optional) Display active entries for the specified address or range of addresses. logical-system (all | <i>logical-system-name</i>) —(Optional) Perform this operation on all logical systems or on a particular logical system. private —(Optional) Display information only about all private, or internal, routing tables.
Required Privilege Level	view
Related Documentation	<ul style="list-style-type: none">• <i>Example: Configuring RIP</i>• <i>Example: Configuring RIPng</i>• <i>Example: Configuring IS-IS</i>• <i>Examples: Configuring Internal BGP Peering</i>• <i>Examples: Configuring External BGP Peering</i>• <i>Examples: Configuring OSPF Routing Policy</i>
List of Sample Output	show route on page 69 show route on page 69 show route destination-prefix on page 70 show route extensive on page 70

Output Fields Table 5 on page 67 describes the output fields for the **show route** command. Output fields are listed in the approximate order in which they appear.

Table 5: show route Output Fields

Field Name	Field Description
<i>routing-table-name</i>	Name of the routing table (for example, inet.0).
<i>number destinations</i>	Number of destinations for which there are routes in the routing table.
<i>number routes</i>	<p>Number of routes in the routing table and total number of routes in the following states:</p> <ul style="list-style-type: none"> • active (routes that are active). • holddown (routes that are in the pending state before being declared inactive). A holddown route was once the active route and is no longer the active route. The route is in the holddown state because a protocol still has interest in the route, meaning that the interest bit is set. A protocol might have its interest bit set on the previously active route because the protocol is still advertising the route. The route will be deleted after all protocols withdraw their advertisement of the route and remove their interest bit. A persistent holddown state often means that the interested protocol is not releasing its interest bit properly. <p>However, if you have configured advertisement of multiple routes (with the add-path or advertise-inactive statement), the holddown bit is most likely set because BGP is advertising the route as an active route. In this case, you can ignore the holddown state because nothing is wrong.</p> <ul style="list-style-type: none"> • hidden (routes that are not used because of a routing policy).
<i>destination-prefix</i>	<p>Route destination (for example:10.0.0.1/24). Sometimes the route information is presented in another format, such as:</p> <ul style="list-style-type: none"> • MPLS-label (for example, 80001). • interface-name (for example, ge-1/0/2). • neighbor-address:control-word-status:encapsulation type:vc-id:source (Layer 2 circuit only. For example, 10.1.1.195:NoCtrlWord:1:1:Local/96): <ul style="list-style-type: none"> • neighbor-address—Address of the neighbor. • control-word-status—Whether the use of the control word has been negotiated for this virtual circuit: NoCtrlWord or CtrlWord. • encapsulation type—Type of encapsulation, represented by a number: (1) Frame Relay DLCI, (2) ATM AAL5 VCC transport, (3) ATM transparent cell transport, (4) Ethernet, (5) VLAN Ethernet, (6) HDLC, (7) PPP, (8) ATM VCC cell transport, (10) ATM VPC cell transport. • vc-id—Virtual circuit identifier. • source—Source of the advertisement: Local or Remote.
[protocol, preference]	<p>Protocol from which the route was learned and the preference value for the route.</p> <ul style="list-style-type: none"> • +—A plus sign indicates the active route, which is the route installed from the routing table into the forwarding table. • -—A hyphen indicates the last active route. • *—An asterisk indicates that the route is both the active and the last active route. An asterisk before a to line indicates the best subpath to the route. <p>In every routing metric except for the BGP LocalPref attribute, a lesser value is preferred. In order to use common comparison routines, Junos OS stores the 1's complement of the LocalPref value in the Preference2 field. For example, if the LocalPref value for Route 1 is 100, the Preference2 value is -101. If the LocalPref value for Route 2 is 155, the Preference2 value is -156. Route 2 is preferred because it has a higher LocalPref value and a lower Preference2 value.</p>

Table 5: show route Output Fields (*continued*)

Field Name	Field Description
<i>weeks:days</i> <i>hours:minutes:seconds</i>	How long the route been known (for example, 2w4d 13:11:14 , or 2 weeks, 4 days, 13 hours, 11 minutes, and 14 seconds).
metric	Cost value of the indicated route. For routes within an AS, the cost is determined by the IGP and the individual protocol metrics. For external routes, destinations, or routing domains, the cost is determined by a preference value.
localpref	Local preference value included in the route.
from	Interface from which the route was received.
AS path	<p>AS path through which the route was learned. The letters at the end of the AS path indicate the path origin, providing an indication of the state of the route at the point at which the AS path originated:</p> <ul style="list-style-type: none"> • I—IGP. • E—EGP. • ?—Incomplete; typically, the AS path was aggregated. <p>When AS path numbers are included in the route, the format is as follows:</p> <ul style="list-style-type: none"> • []—Brackets enclose the local AS number associated with the AS path if more than one AS number is configured on the routing device, or if AS path prepending is configured. • { }—Braces enclose AS sets, which are groups of AS numbers in which the order does not matter. A set commonly results from route aggregation. The numbers in each AS set are displayed in ascending order. • ()—Parentheses enclose a confederation. • ([])—Parentheses and brackets enclose a confederation set. <p>NOTE: In Junos OS Release 10.3 and later, the AS path field displays an unrecognized attribute and associated hexadecimal value if BGP receives attribute 128 (attribute set) and you have not configured an independent domain in any routing instance.</p>
validation-state	<p>(BGP-learned routes) Validation status of the route:</p> <ul style="list-style-type: none"> • Invalid—Indicates that the prefix is found, but either the corresponding AS received from the EBGP peer is not the AS that appears in the database, or the prefix length in the BGP update message is longer than the maximum length permitted in the database. • Unknown—Indicates that the prefix is not among the prefixes or prefix ranges in the database. • Valid—Indicates that the prefix and autonomous system pair are found in the database.
to	<p>Next hop to the destination. An angle bracket (>) indicates that the route is the selected route.</p> <p>If the destination is Discard, traffic is dropped.</p>

Table 5: show route Output Fields (*continued*)

Field Name	Field Description
via	<p>Interface used to reach the next hop. If there is more than one interface available to the next hop, the interface that is actually used is followed by the word Selected. This field can also contain the following information:</p> <ul style="list-style-type: none"> • Weight—Value used to distinguish primary, secondary, and fast reroute backup routes. Weight information is available when MPLS label-switched path (LSP) link protection, node-link protection, or fast reroute is enabled, or when the standby state is enabled for secondary paths. A lower weight value is preferred. Among routes with the same weight value, load balancing is possible. • Balance—Balance coefficient indicating how traffic of unequal cost is distributed among next hops when a routing device is performing unequal-cost load balancing. This information is available when you enable BGP multipath load balancing. • lsp-path-name—Name of the LSP used to reach the next hop. • label-action—MPLS label and operation occurring at the next hop. The operation can be pop (where a label is removed from the top of the stack), push (where another label is added to the label stack), or swap (where a label is replaced by another label). For VPNs, expect to see multiple push operations, corresponding to the inner and outer labels required for VPN routes (in the case of a direct PE-to-PE connection, the VPN route would have the inner label push only).

Sample Output

show route

```

user@host> show route
inet.0: 11 destinations, 12 routes (11 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

1:65500:1:10.0.0.20/240
    *[MVPN/70] 19:53:41, metric2 1
    Indirect
1:65500:1:10.0.0.40/240
    *[BGP/170] 19:53:29, localpref 100, from 10.0.0.30
    AS path: I
    > to 10.0.24.4 via lt-0/3/0.24, label-switched-path toD
    [BGP/170] 19:53:26, localpref 100, from 10.0.0.33
    AS path: I
    > to 10.0.24.4 via lt-0/3/0.24, label-switched-path toD
1:65500:1:10.0.0.60/240
    *[BGP/170] 19:53:29, localpref 100, from 10.0.0.30
    AS path: I
    > to 10.0.28.8 via lt-0/3/0.28, label-switched-path toF
    [BGP/170] 19:53:25, localpref 100, from 10.0.0.33
    AS path: I
    > to 10.0.28.8 via lt-0/3/0.28, label-switched-path toF

```

show route

The following sample output shows a VPN route with composite next hops enabled. The first **Push** operation corresponds to the outer label. The second **Push** operation corresponds to the inner label.

```

user@host> show route 70.0.0.0

13979:665001.inet.0: 871 destinations, 3556 routes (871 active, 0 holddown, 0
hidden)

```

+ = Active Route, - = Last Active, * = Both

```
70.0.0.0/24      @[BGP/170] 00:28:32, localpref 100, from 10.9.9.160
                  AS path: 13980 ?
                  > to 10.100.0.42 via ae2.0, Push 16, Push 300368(top)
                  [BGP/170] 00:28:28, localpref 100, from 10.9.9.169
                  AS path: 13980 ?
                  > to 10.100.0.42 via ae2.0, Push 126016, Push 300368(top)
                  #[Multipath/255] 00:28:28, metric2 102
                  > to 10.100.0.42 via ae2.0, Push 16, Push 300368(top)
                  to 10.100.0.42 via ae2.0, Push 16, Push 300368(top)
```

show route destination-prefix

```
user@host> show route 172.16.0.0/12
```

```
inet.0: 10 destinations, 10 routes (9 active, 0 holddown, 1 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
172.16.0.0/12      *[Static/5] 2w4d 12:54:27
                  > to 192.168.167.254 via fxp0.0
```

show route extensive

```
user@host> show route extensive
```

```
v1.mvpn.0: 5 destinations, 8 routes (5 active, 1 holddown, 0 hidden)
1:65500:1:10.0.0.40/240 (1 entry, 1 announced)
  *BGP Preference: 170/-101
    PMSI: Flags 0x0: Label[0:0:0]: PIM-SM: Sender 10.0.0.40 Group 225.1.1.1

    Next hop type: Indirect
    Address: 0x92455b8
    Next-hop reference count: 2
    Source: 10.0.0.30
    Protocol next hop: 10.0.0.40
    Indirect next hop: 2 no-forward
    State: <Active Int Ext>
      Local AS: 65500 Peer AS: 65500
    Age: 3 Metric2: 1
    Task: BGP_65500.10.0.0.30+179
    Announcement bits (2): 0-PIM.v1 1-mvpn global task
    AS path: I (Originator) Cluster list: 10.0.0.30
    AS path: Originator ID: 10.0.0.40
    Communities: target:65520:100
    Import Accepted
    Localpref: 100
    Router ID: 10.0.0.30
    Primary Routing Table bgp.mvpn.0
    Indirect next hops: 1
      Protocol next hop: 10.0.0.40 Metric: 1
      Indirect next hop: 2 no-forward
      Indirect path forwarding next hops: 1
        Next hop type: Router
        Next hop: 10.0.24.4 via lt-0/3/0.24 weight 0x1
      10.0.0.40/32 Originating RIB: inet.3
        Metric: 1 Node path count: 1
        Forwarding nexthops: 1
          Nexthop: 10.0.24.4 via lt-0/3/0.24
```

PART 5

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