

Technology Overview

Understanding the Auto Export Feature

Release

11.4



Published: 2011-11-08

Juniper Networks, Inc.
1194 North Mathilda Avenue
Sunnyvale, California 94089
USA
408-745-2000
www.juniper.net

This product includes the Envoy SNMP Engine, developed by Epilogue Technology, an Integrated Systems Company. Copyright © 1986-1997, Epilogue Technology Corporation. All rights reserved. This program and its documentation were developed at private expense, and no part of them is in the public domain.

This product includes memory allocation software developed by Mark Moraes, copyright © 1988, 1989, 1993, University of Toronto.

This product includes FreeBSD software developed by the University of California, Berkeley, and its contributors. All of the documentation and software included in the 4.4BSD and 4.4BSD-Lite Releases is copyrighted by the Regents of the University of California. Copyright © 1979, 1980, 1983, 1986, 1988, 1989, 1991, 1992, 1993, 1994. The Regents of the University of California. All rights reserved.

GateD software copyright © 1995, the Regents of the University. All rights reserved. Gate Daemon was originated and developed through release 3.0 by Cornell University and its collaborators. Gated is based on Kirton's EGP, UC Berkeley's routing daemon (routed), and DCN's HELLO routing protocol. Development of Gated has been supported in part by the National Science Foundation. Portions of the GateD software copyright © 1988, Regents of the University of California. All rights reserved. Portions of the GateD software copyright © 1991, D. L. S. Associates.

This product includes software developed by Maker Communications, Inc., copyright © 1996, 1997, Maker Communications, Inc.

Juniper Networks, Junos, Steel-Belted Radius, NetScreen, and ScreenOS are registered trademarks of Juniper Networks, Inc. in the United States and other countries. The Juniper Networks Logo, the Junos logo, and JunosE are trademarks of Juniper Networks, Inc. All other trademarks, service marks, registered trademarks, or registered service marks are the property of their respective owners.

Juniper Networks assumes no responsibility for any inaccuracies in this document. Juniper Networks reserves the right to change, modify, transfer, or otherwise revise this publication without notice.

Products made or sold by Juniper Networks or components thereof might be covered by one or more of the following patents that are owned by or licensed to Juniper Networks: U.S. Patent Nos. 5,473,599, 5,905,725, 5,909,440, 6,192,051, 6,333,650, 6,359,479, 6,406,312, 6,429,706, 6,459,579, 6,493,347, 6,538,518, 6,538,899, 6,552,918, 6,567,902, 6,578,186, and 6,590,785.

Technology Overview Understanding the Auto Export Feature

Release 11.4

Copyright © 2011, Juniper Networks, Inc.

All rights reserved.

Revision History

October 2011—R1 Junos OS 11.4

The information in this document is current as of the date listed in the revision history.

YEAR 2000 NOTICE

Juniper Networks hardware and software products are Year 2000 compliant. Junos OS has no known time-related limitations through the year 2038. However, the NTP application is known to have some difficulty in the year 2036.

END USER LICENSE AGREEMENT

The Juniper Networks product that is the subject of this technical documentation consists of (or is intended for use with) Juniper Networks software. Use of such software is subject to the terms and conditions of the End User License Agreement ("EULA") posted at <http://www.juniper.net/support/eula.html>. By downloading, installing or using such software, you agree to the terms and conditions of that EULA.

Table of Contents

Introduction	1
Auto Export Feature Overview	3
Example: Configuring and Verifying the Auto Export Feature	5

Introduction

This document describes the Auto Export feature and how it can be configured to overcome the limitation of local prefix leaking and automatically export routes between local VPN routing and forwarding (VRF) routing instances.

Auto Export Feature Overview

An MPLS Layer 3 VPN consists of provider edge (PE) routers that operate between different service provider areas, and customer edge (CE) routers that operate between the customer location and a service provider area. The traffic is carried over the MPLS backbone.

In Layer 3 VPNs, multiple CE routers can belong to a single VRF routing instance on a PE router. A PE router can have multiple VRF routing instances. In some cases, shared services might require routes to be written to multiple VRF routing tables, both at the local and remote PE router. This requires the PE router to share route information among each configured VRF routing instance. This exchange of route information is accomplished by creating and applying custom **vrf-export** and **vrf-import** policies that utilize BGP extended community attributes to create hub-and-spoke topologies. This exchange of routing information, such as route prefixes, is known as prefix leaking.

There are two kinds of prefix leaking: local and remote.

Remote prefix leaking takes place when the source VRF routing instance and destination VRF routing instance are on different PE routers. This is achieved by using BGP extended community attributes through the use of the **route-target** community that works on remote PE routers, but not on local PE routers. Custom policies, such as **vrf-export** and **vrf-import**, do not leak prefixes between VRF routing instances if the source VRF routing instance and the destination VRF routing instance are on the same PE router.

Local prefix leaking is when the source VRF routing instance and the destination VRF routing instance are on the same PE router. Similar to the split-horizon rule, prefixes learned on the PE router from local CE routers can be shared with other remote PE routers, but the routes cannot be shared locally.

The Auto Export feature leaks prefixes between VRF routing instances that are locally configured on a given PE router. The Auto Export feature is enabled by using the **auto-export** statement.

Auto Export is always applied on the local PE router, because it takes care of only local prefix leaking by evaluating the export policy of each VRF and determining which route targets can be leaked locally. The standard VRF import and export policies still affect only the remote PE prefix leaking.

Related Documentation

- [Example: Configuring and Verifying the Auto Export Feature on page 5](#)

Example: Configuring and Verifying the Auto Export Feature

This example shows how to configure the Auto Export feature.

- [Requirements on page 5](#)
- [Overview and Topology on page 5](#)
- [Configuration on page 6](#)
- [Verification on page 10](#)

Requirements

This example uses the following hardware and software components:

- Junos OS Release 7.3 or later
- Two Juniper Networks SRX Series Services Gateways, J Series Services Routers, M Series Multiservice Edge Routers, MX Series 3D Universal Edge Routers, or T Series Core Routers

Overview and Topology

The Auto Export feature must be applied on the local PE router, in this example, Router PE2. The local VRF routing instances are configured on Router PE2. The resulting routing entries are based on the applied **vrf-import** and **vrf-export** policies.

In this example configuration:

- The Common Services and Management VRF routing instances are attached only to the local PE router, Router PE2.
- The Customer 2 VRF routing instance acts as the control VRF routing instance to illustrate the effect of the **auto-export** statement on any VRF routing instance that does not use custom policies.

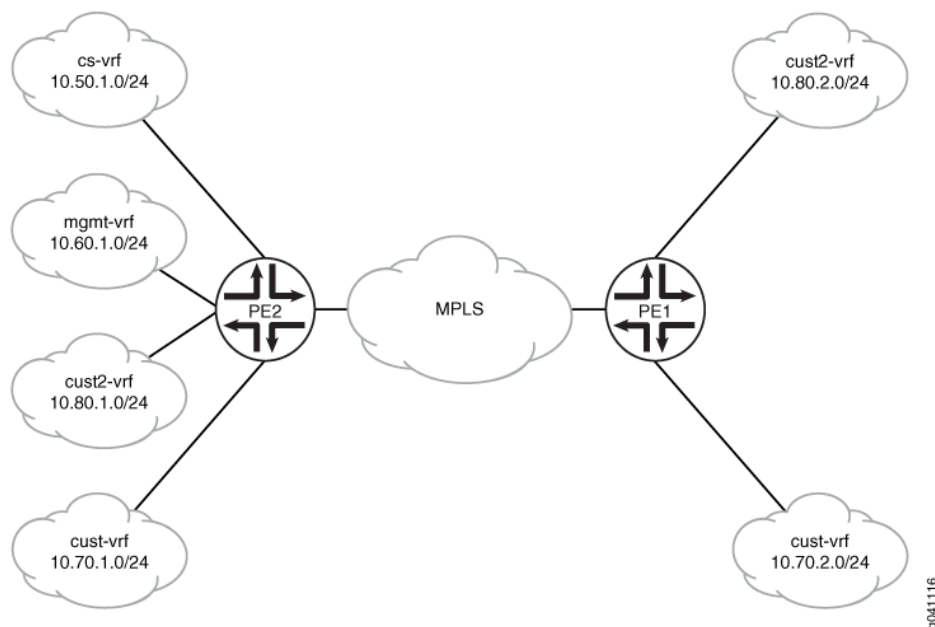
[Table 1 on page 5](#) shows the VRF routing instances and address spaces that are used in this example.

Table 1: VRF Address Mapping

VRF Name	VRF Notation	Assigned Address Space
Common Services	cs-vrf	target: 65000:50 – 10.50.0.0
Management	mgmt-vrf	target: 65000:60 – 10.60.0.0
Customer 1	cust-vrf	target: 65000:70 – 10.70.0.0
Customer 2	cust2-vrf	target: 65000:80 – 10.80.0.0

The topology of the network is shown in [Figure 1 on page 6](#).

Figure 1: Layer 3 VPN Example for Demonstrating the Auto Export Feature



Configuration

To configure the Auto Export feature, perform these tasks:

- [Configuring VRF Routing Instances on the Local PE Router \(PE2\) on page 6](#)
- [Configuring VRF Routing Instances on the Remote PE Router \(PE1\) on page 7](#)
- [Before Configuring Auto Export on page 9](#)
- [Configuring Auto Export on page 10](#)

Configuring VRF Routing Instances on the Local PE Router (PE2)

Step-by-Step Procedure

To configure the VRF routing instances on Router PE2:

1. Configure the Common Services VRF routing instance (**cs-vrf**) and assign it to the 10.50.1.0/24 network.

```
[edit routing-instances]
user@PE2# set cs-vrf instance-type vrf
user@PE2# set cs-vrf interface ge-0/0/0.50
user@PE2# set cs-vrf route-distinguisher 10.3.3.3:50
user@PE2# set cs-vrf vrf-target target:65000:50
user@PE2# set cs-vrf vrf-table-label
```

2. Configure the Customer 1 VRF routing instance (**cust-vrf**) and assign it to the 10.70.1.0/24 network.

```
[edit routing-instances]
user@PE2# set cust-vrf instance-type vrf
user@PE2# set cust-vrf interface ge-0/0/0.70
user@PE2# set cust-vrf route-distinguisher 10.3.3.3:70
user@PE2# set cust-vrf vrf-import cust-vrf-import
```

```

user@PE2# set cust-vrf vrf-export cust-vrf-export
user@PE2# set cust-vrf vrf-table-label

```

3. Configure the Customer 2 VRF routing instance (**cust2-vrf**) and assign it to the 10.80.1.0/24 network.

```

[edit routing-instances]
user@PE2# set cust2-vrf instance-type vrf
user@PE2# set cust2-vrf interface ge-0/0/0.80
user@PE2# set cust2-vrf route-distinguisher 10.3.3.3:80
user@PE2# set cust2-vrf vrf-target target:65000:80
user@PE2# set cust2-vrf vrf-table-label

```

4. Configure the Management VRF routing instance (**mgmt-vrf**) and assign it to the 10.60.1.0/24 network.

```

[edit routing-instances]
user@PE2# set mgmt-vrf instance-type vrf
user@PE2# set mgmt-vrf interface ge-0/0/0.60
user@PE2# set mgmt-vrf route-distinguisher 10.3.3.3:60
user@PE2# set mgmt-vrf vrf-target target:65000:60
user@PE2# set mgmt-vrf vrf-table-label

```

5. Configure the export policy (**cust-vrf-export**).

The **cust-vrf-export** policy exports routes to the remote router (PE1). The export policy is inherited when the Auto Export feature is applied on the router.

```

[edit policy-options]
user@PE2# set policy-statement cust-vrf-export term 1 from protocol direct
user@PE2# set policy-statement cust-vrf-export term 1 then community add
    cust-vrf-comm
user@PE2# set policy-statement cust-vrf-export term 1 then accept

```

6. Configure the import policy (**cust-vrf-import**).

The **cust-vrf-import** policy imports remote routes (on Router PE1) by using BGP extended community attributes.

```

[edit policy-options]
user@PE2# set policy-statement cust-vrf-import term 1 from community [
    cs-vrf-comm mgmt-vrf-comm cust-vrf-comm ]
user@PE2# set policy-statement cust-vrf-import term 1 then accept
user@PE2# set policy-statement cust-vrf-import term default then reject

```

7. Configure the VRF routing instance communities.

```

[edit policy-options]
user@PE2# set community cs-vrf-comm members target:65000:50
user@PE2# set community cust-vrf-comm members target:65000:70
user@PE2# set community cust2-vrf-comm members target:65000:80
user@PE2# set community mgmt-vrf-comm members target:65000:60

```

Configuring VRF Routing Instances on the Remote PE Router (PE1)

Step-by-Step Procedure

To configure the VRF routing instances on Router PE1:

1. Configure the Customer 1 VRF routing instance (**cust-vrf**) and assign it to the 10.70.2.0/24 network.

```
[edit routing-instances]
user@PE1# set cust-vrf instance-type vrf
user@PE1# set cust-vrf interface ge-0/0/0.70
user@PE1# set cust-vrf route-distinguisher 10.2.2.2:70
user@PE1# set cust-vrf vrf-import cust-vrf-import
user@PE1# set cust-vrf vrf-export cust-vrf-export
user@PE1# set cust-vrf vrf-table-label
```

2. Configure the Customer 2 VRF routing instance (**cust2-vrf**) and assign it to the 10.80.2.0/24 network.

The Customer 2 VRF routing instance uses the **vrf-target** statement to eliminate having to apply a custom policy.

```
[edit routing-instances]
user@PE1# set cust2-vrf instance-type vrf
user@PE1# set cust2-vrf interface ge-0/0/0.80
user@PE1# set cust2-vrf route-distinguisher 10.2.2.2:80
user@PE1# set cust2-vrf vrf-target target:65000:80
user@PE1# set cust2-vrf vrf-table-label
```

3. Configure the export policy (**cust-vrf-export**).

The **cust-vrf-export** policy exports routes to the remote router (Router PE2) by using BGP extended community attributes.

```
[edit policy-options]
user@PE1# set policy-statement cust-vrf-export term 1 from protocol direct
user@PE1# set policy-statement cust-vrf-export term 1 then community add
    cust-vrf-comm
user@PE1# set policy-statement cust-vrf-export term 1 then accept
```

4. Configure the import policy (**cust-vrf-import**).

The **cust-vrf-import** policy imports remote routes (from Router PE2) by using BGP extended community attributes.

```
[edit policy-options]
user@PE1# set policy-statement cust-vrf-import term 1 from community [
    cs-vrf-comm mgmt-vrf-comm cust-vrf-comm ]
user@PE1# set policy-statement cust-vrf-import term 1 then accept
user@PE1# set policy-statement cust-vrf-import term default then reject
```

5. Configure the VRF routing instance communities.

```
[edit policy-options]
user@PE1# set community cs-vrf-comm members target:65000:50
user@PE1# set community cust-vrf-comm members target:65000:70
user@PE1# set community cust2-vrf-comm members target:65000:80
user@PE1# set community mgmt-vrf-comm members target:65000:60
```

Before Configuring Auto Export

Step-by-Step Procedure Prior to enabling the Auto Export feature on Router PE2, Router PE1 has the Common Services and Management VRF VPN prefixes in the Customer 1 VRF routing tables and Router PE2 does not.

To verify that Router PE1 has the Common Services and Management VRF VPN prefixes in the Customer 1 VRF routing tables and Router PE2 does not:

1. On Router PE2, display the routing table for the **cust-vrf** routing instance by using the **show route table cust-vrf-inet.0** command.

Notice that only the Customer 1 routes are in the routing table. No prefix leaking has taken place.

```
user@PE2> show route table cust-vrf-inet.0

cust-vrf.inet.0: 3 destinations, 3 routes (3 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.70.1.0/24      *[BGP/170] 00:04:22, localpref 100, from 10.2.2.2
                  AS path: I
                  > to 172.16.2.1 via ge-0/0/0.0, Push 16
10.70.2.0/24      *[Direct/0] 00:56:37
                  > via ge-0/0/0.70
10.70.2.1/32      *[Local/0] 00:56:37
                  Local via ge-0/0/0.70
```

2. On Router PE1, display the routing table for the **cust-vrf** routing instance by using the **show route table cust-vrf-inet.0** command.

Notice that Common Services and Management VRF prefixes have leaked into the routing table.

```
user@PE1> show route table cust-vrf-inet.0

cust-vrf.inet.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.50.2.0/24      *[BGP/170] 00:11:11, localpref 100, from 10.3.3.3
                  AS path: I
                  > to 172.16.2.2 via ge-0/0/0.0, Push 16
10.60.2.0/24      *[BGP/170] 00:11:11, localpref 100, from 10.3.3.3
                  AS path: I
                  > to 172.16.2.2 via ge-0/0/0.0, Push 19
10.70.1.0/24      *[Direct/0] 00:54:22
                  > via ge-0/0/0.70
10.70.1.1/32      *[Local/0] 00:54:22
                  Local via ge-0/0/0.70
10.70.2.0/24      *[BGP/170] 00:11:11, localpref 100, from 10.3.3.3
                  AS path: I
                  > to 172.16.2.2 via ge-0/0/0.0, Push 17
```

The Common Services (**cs-vrf**) route prefixes and the Management (**mgmt-vrf**) route prefixes have leaked into the Customer 1 VRF routing table because the custom policy (**cust-vrf-import**) is applied on Router PE1. This leaking of prefixes has not taken place on Router PE2.

Results This indicates that prefix leaking takes place on remote PE routers and not on local PE routers. The Auto Export feature enables local prefix leaking.

Configuring Auto Export

**Step-by-Step
Procedure**

To configure the Auto Export feature on Router PE2:

1. Create a group for applying the auto export feature.

In this example, the group is named as **auto-export-test**.

```
[edit groups]
```

```
user@PE2# set auto-export-test routing-instances <*> routing-options auto-export
```

2. Apply Auto Export to the Common Services VRF.

```
[edit routing-instances]
```

```
user@PE2# set cs-vrf routing-options auto export
```

3. Apply Auto Export to the Customer 1 VRF.

```
[edit routing-instances]
```

```
user@PE2# set cust-vrf routing-options auto export
```

4. Apply Auto Export to the Customer 2 VRF.

```
[edit routing-instances]
```

```
user@PE2# set cust2-vrf routing-options auto export
```

5. Apply Auto Export to the Management VRF.

```
[edit routing-instances]
```

```
user@PE2# set mgmt-vrf routing-options auto export
```

Results The Auto Export feature is now applied to the local PE router, which causes the local VRF route prefixes to leak into the local customer VRF.

Verification

Verifying Route Leaking

Purpose To verify that the Auto Export feature enables automatic leaking of route prefixes between locally configured VRF routing instances on a PE router.

Action Verify the Auto Export feature by viewing the Customer 1 VRF routes on Routers PE2 and PE1.

To confirm that the configuration is working properly:

1. On Router PE2, display the routing table for the **cust-vrf** routing instance by using the **show route table cust-vrf-inet.0** statement.

```
user@PE2> show route table cust-vrf-inet.0
```

```
cust-vrf.inet.0: 7 destinations, 7 routes (7 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both
```

```
10.50.2.0/24          *[Direct/0] 00:00:06
```

```

10.50.2.1/32      > via ge-0/0/0.50
                  *[Local/0] 00:00:06
                  Local via ge-0/0/0.50
10.60.2.0/24     *[Direct/0] 00:00:06
                  > via ge-0/0/0.60
10.60.2.1/32     *[Local/0] 00:00:06
                  Local via ge-0/0/0.60
10.70.1.0/24     *[BGP/170] 00:00:06, localpref 100, from 10.2.2.2
                  AS path: I
                  > to 172.16.2.1 via ge-0/0/0.0, Push 16
10.70.2.0/24     *[Direct/0] 01:16:47
                  > via ge-0/0/0.70
10.70.2.1/32     *[Local/0] 01:16:47
                  Local via ge-0/0/0.70

```

The lines of output that start with **10.50.2.0/24** and **10.50.2.1/32** show that Common Services route prefixes have leaked into the Customer 1 VRF routing table. The lines of output that start with **10.60.2.0/24** and **10.60.2.1/32** show that Management route prefixes have leaked into the Customer 1 VRF routing table.

2. On Router PE1, display the routing table for the **cust-vrf** routing instance by using the **show route table cust-vrf-inet.0** statement.

```

user@PE1> show route table cust-vrf-inet.0

cust-vrf.inet.0: 5 destinations, 5 routes (5 active, 0 holddown, 0 hidden)
+ = Active Route, - = Last Active, * = Both

10.50.2.0/24     *[BGP/170] 00:11:11, localpref 100, from 10.3.3.3
                  AS path: I
                  > to 172.16.2.2 via ge-0/0/0.0, Push 16
10.60.2.0/24     *[BGP/170] 00:11:11, localpref 100, from 10.3.3.3
                  AS path: I
                  > to 172.16.2.2 via ge-0/0/0.0, Push 19
10.70.1.0/24     *[Direct/0] 00:54:22
                  > via ge-0/0/0.70
10.70.1.1/32     *[Local/0] 00:54:22
                  Local via ge-0/0/0.70
10.70.2.0/24     *[BGP/170] 00:11:11, localpref 100, from 10.3.3.3
                  AS path: I
                  > to 172.16.2.2 via ge-0/0/0.0, Push 17

```

The Customer 1 VRF routing table entries on Router PE1 are unchanged.

Meaning On applying the Auto Export feature on Router PE2, the Common Services and Management VRF prefixes are copied into the Customer 1 VRF routing table on Router PE2. The Customer 1 VRF routing table entries on Router PE1 are unchanged.

Thus, the Auto Export feature helps local prefix leaking.

Related Documentation

- [auto-export](#)
- [Auto Export Feature Overview on page 3](#)
- [Configuring Policy-Based Export for Routing Instances](#)
- [Defining BGP Communities and Extended Communities for Use in Routing Policy Match Conditions](#)

