Configuring MPLS VPN Route Target Rewrite

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Prerequisites for MPLS VPN Route Target Rewrite

- You should know how to configure Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs).
- You need to identify the RT replacement policy and target device for the autonomous system (AS).

Restrictions for MPLS VPN Route Target Rewrite

Route Target Rewrite can only be implemented in a single AS topology.

ip unnumbered command is not supported in MPLS configuration.

Information About MPLS VPN Route Target Rewrite

This section provides information about MPLS VPN Route Target Rewrite:

Route Target Replacement Policy

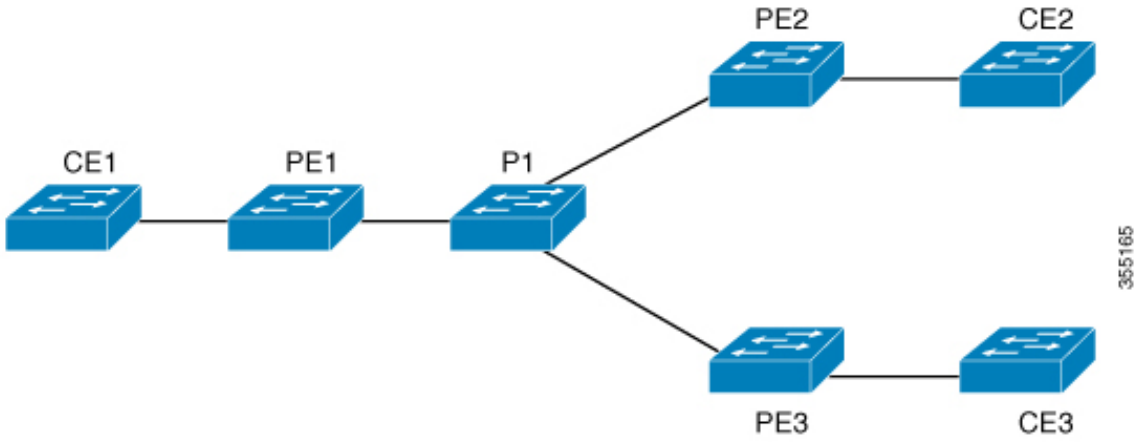
Routing policies for a peer include all configurations that may impact inbound or outbound routing table updates. The MPLS VPN Route Target Rewrite feature can influence routing table updates by allowing the replacement of route targets on inbound and outbound Border Gateway Protocol (BGP) updates. Route targets are carried as extended community attributes in BGP Virtual Private Network IP Version 4 (VPNv4) updates. Route target extended community attributes are used to identify a set of sites and VPN routing and forwarding (VRF) instances that can receive routes with a configured route target.

You can configure the MPLS VPN Route Target Rewrite feature on provider edge (PE) devices.

The figure below shows an example of route target replacement on PE devices in an Multiprotocol Label Switching (MPLS) VPN single autonomous system topology. This example includes the following configurations:

- PE1 is configured to import and export RT 65000:1 for VRF Customer A and to rewrite all inbound VPNv4 prefixes with RT 65000:1 to RT 65000:2.
- PE2 is configured to import and export RT 65000:2 for VRF Customer B and to rewrite all inbound VPNv4 prefixes with RT 65000:2 to RT 65000:1.

Figure 1: Route Target Replacement on Provide Edge(PE) devices in a single MPLS VPN Autonomous System Topology



Route Maps and Route Target Replacement

The MPLS VPN Route Target Rewrite feature extends the Border Gateway Protocol (BGP) inbound/outbound route map functionality to enable route target replacement. The **set extcomm-list delete** command entered in route-map configuration mode allows the deletion of a route target extended community attribute based on an extended community list.

How to Configure MPLS VPN Route Target Rewrite

This section provides the configuration steps for MPLS VPN Route Target Rewrite:

Configuring a Route Target Replacement Policy

Perform this task to configure a route target (RT) replacement policy for your internetwork.

If you configure a provider edge (PE) device to rewrite RT *x* to RT *y* and the PE has a virtual routing and forwarding (VRF) instance that imports RT *x* , you need to configure the VRF to import RT *y* in addition to RT *x* .

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ip extcommunity-list** {*standard-list-number* | *expanded-list-number*} {**permit** | **deny**} [*regular-expression*] [**rt** | **soo** *extended-community-value*] **Example:** `Device(config)# ip extcommunity-list 1 permit rt 65000:2`	Creates an extended community access list and controls access to it. • The *standard-list-number* argument is an integer from 1 to 99 that identifies one or more permit or deny groups of extended communities. • The *expanded-list-number* argument is an integer from 100 to 500 that identifies one or more permit or deny groups of extended communities. Regular expressions can be configured with expanded lists but not standard lists. • The **permit** keyword permits access for a matching condition. • The **deny** keyword denies access for a matching condition. • The *regular-expression* argument specifies an input string pattern to match against. When you use an expanded extended community list to match route targets, include the pattern RT: in the regular expression. • The **rt** keyword specifies the route target extended community attribute. The **rt** keyword can be configured only with standard extended community lists and not expanded community lists. • The **soo** keyword specifies the site of origin (SOO) extended community attribute. The **soo** keyword can be configured only with standard extended

	Command or Action	Purpose
		community lists and not expanded community lists. • The *extended-community-value* argument specifies the route target or site of origin. The value can be one of the following combinations: • autonomous-system-number:network-number • ip-address:network-number The colon is used to separate the autonomous system number and network number or IP address and network number.
Step 4	**route-map** *map-name* [**permit** | **deny**] [*sequence-number*] **Example:** `Device(config)# route-map rtrewrite permit 10`	Defines the conditions for redistributing routes from one routing protocol into another or enables policy routing and enables route-map configuration mode. • The *map-name* argument defines a meaningful name for the route map. The **redistribute** router configuration command uses this name to reference this route map. Multiple route maps can share the same map name. • If the match criteria are met for this route map, and the **permit** keyword is specified, the route is redistributed as controlled by the set actions. In the case of policy routing, the packet is policy routed. If the match criteria are not met, and the **permit** keyword is specified, the next route map with the same map tag is tested. If a route passes none of the match criteria for the set of route maps sharing the same name, it is not redistributed by that set. The **permit** keyword is the default. • If the match criteria are met for the route map and the **deny** keyword is specified, the route is not redistributed. In the case of policy routing, the packet is not policy routed, and no further route maps sharing the same map tag name will be examined. If the packet is not policy routed, the normal forwarding algorithm is used.

	Command or Action	Purpose
		• The *sequence-number* argument is a number that indicates the position a new route map will have in the list of route maps already configured with the same name. If given with the **no** form of this command, the position of the route map should be deleted.

Step 5	**match extcommunity** {*standard-list-number* | *expanded-list-number*}
	Example:
	`Device(config-route-map)# match extcommunity 1`
	Example:
	`Device(config-route-map)# match extcommunity 101`
		Matches the Border Gateway Protocol (BGP) extended community list attributes.
		• The *standard-list-number* argument is a number from 1 to 99 that identifies one or more permit or deny groups of extended community attributes.
		• The *expanded-list-number* argument is a number from 100 to 500 that identifies one or more permit or deny groups of extended community attributes.

Step 6	**set extcomm-list** *extended-community-list-number* **delete** **Example:** `Device(config-route-map)# set extcomm-list 1 delete`	Removes a route target from an extended community attribute of an inbound or outbound BGP Virtual Private Network Version 4 (VPNv4) update. • The *extended-community-list-number* argument specifies the extended community list number.

Step 7	**set extcommunity** {**rt** *extended-community-value* [**additive**] | **soo** *extended-community-value*}
	Example:
	`Device(config-route-map)# set extcommunity rt 65000:1 additive`
		Sets BGP extended community attributes.
		• The **rt** keyword specifies the route target extended community attribute.
		• The **soo** keyword specifies the site of origin extended community attribute.
		• The *extended-community-value* argument specifies the value to be set. The value can be one of the following combinations:
		  • autonomous-system-number : network-number
		  • ip-address : network-number
		The colon is used to separate the autonomous system number and network number or IP address and network number.

	Command or Action	Purpose
		• The **additive** keyword adds a route target to the existing route target list without replacing any existing route targets.
Step 8	**end** **Example:** `Device(config-route-map)# end`	(Optional) Returns to privileged EXEC mode.
Step 9	**show route-map** *map-name* **Example:** `Device# show route-map extmap`	(Optional) Verifies that the match and set entries are correct. • The *map-name* argument is the name of a specific route map.

Applying the Route Target Replacement Policy

Perform the following tasks to apply the route target replacement policy to your network:

Associating Route Maps with Specific BGP Neighbors

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router bgp** *as-number* **Example:** `Device(config)# router bgp 100`	Configures a Border Gateway Protocol (BGP) routing process and places the device in router configuration mode. • The *as-number* argument indicates the number of an autonomous system that identifies the device to other BGP devices and tags the routing information passed along. The range is 0 to 65535. Private autonomous system numbers that can be used in internal networks range from 64512 to 65535.

	Command or Action	Purpose
Step 4	**neighbor** {*ip-address* | *peer-group-name*} **remote-as** *as-number* **Example:** `Device(config-router)# neighbor 172.10.0.2 remote-as 200`	Adds an entry to the BGP or multiprotocol BGP neighbor table. • The *ip-address* argument specifies the IP address of the neighbor. • The *peer-group-name* argument specifies the name of a BGP peer group. • The *as-number* argument specifies the autonomous system to which the neighbor belongs.
Step 5	**address-family vpnv4** [**unicast**] **Example:** `Device(config-router)# address-family vpnv4`	Enters address family configuration mode for configuring routing sessions, such as BGP, that use standard Virtual Private Network Version 4 (VPNv4) address prefixes. • The optional **unicast** keyword specifies VPNv4 unicast address prefixes.
Step 6	**neighbor** {*ip-address* | *peer-group-name*} **activate** **Example:** `Device(config-router-af)# neighbor 172.16.0.2 activate`	Enables the exchange of information with a neighboring BGP device. • The *ip-address* argument specifies the IP address of the neighbor. • The *peer-group-name* argument specifies the name of a BGP peer group.
Step 7	**neighbor** {*ip-address* | *peer-group-name*} **send-community** [**both** | **extended** | **standard**] **Example:** `Device(config-router-af)# neighbor 172.16.0.2 send-community extended`	Specifies that a communities attribute should be sent to a BGP neighbor. • The *ip-address* argument specifies the IP address of the BGP-speaking neighbor. • The *peer-group-name* argument specifies the name of a BGP peer group. • The **both** keyword sends standard and extended community attributes. • The **extended** keyword sends an extended community attribute. • The **standard** keyword sends a standard community attribute.
Step 8	**neighbor** {*ip-address* | *peer-group-name*} **route-map** *map-name* {**in** | **out**} **Example:**	Apply a route map to incoming or outgoing routes • The *ip-address* argument specifies the IP address of the neighbor.

	Command or Action	Purpose
	`Device(config-router-af)# neighbor 172.16.0.2 route-map extmap in`	• The *peer-group-name* argument specifies the name of a BGP or multiprotocol peer group. • The *map-name* argument specifies the name of a route map. • The **in** keyword applies route map to incoming routes. • The **out** keyword applies route map to outgoing routes.
Step 9	**end** **Example:** `Device(config-router-af)# end`	(Optional) Returns to privileged EXEC mode.

Verifying the Route Target Replacement Policy

Procedure

Step 1 **enable**

Enables privileged EXEC mode. Enter your password if prompted.

Example:

```
Device> enable
Device#
```

Step 2 **show ip bgp vpnv4 vrf** *vrf-name*

Verifies that Virtual Private Network Version 4 (VPNv4) prefixes with a specified route target (RT) extended community attribute are replaced with the proper RT extended community attribute to verify that the provider edge (PE) devices receive the rewritten RT extended community attributes.

Verify route target replacement on PE1:

Example:

```
Device# show ip bgp vpnv4 vrf Customer_A 192.168.1.1/32 internal
BGP routing table entry for 65000:1:192.168.1.1/32, version 6901
Paths: (1 available, best #1, table Customer_A)
  Advertised to update-groups:
     5
  Refresh Epoch 1
  650002
    3.3.3.3 (metric 3) (via default) from 3.3.3.3 (55.5.4.1)
      Origin IGP, metric 0, localpref 100, valid, internal, best
      Extended Community: RT:65000:1
      mpls labels in/out nolabel/3025
```

```
rx pathid: 0, tx pathid: 0x0
net: 0xFFB0A72E38, path: 0xFFB0E6A370, pathext: 0xFFB0E5D970
flags: net: 0x0, path: 0x7, pathext: 0x181
```

Step 3 **exit**

Returns to user EXEC mode:

Example:

```
Device# exit
Device>
```

Configuration Examples for MPLS VPN Route Target Rewrite

The following section provides configuration examples for MPLS VPN Route Target Rewrite:

Examples: Applying Route Target Replacement Policies

Examples: Associating Route Maps with Specific BGP Neighbor

This example shows the association of route map extmap with a Border Gateway Protocol (BGP) neighbor. The BGP inbound route map is configured to replace route targets (RTs) on incoming updates.

```
router bgp 1
address-family vpnv4
neighbor 2.2.2.2 route-map rtrewrite in
```

This example shows the association of the same route map with the outbound BGP neighbor. The route map is configured to replace RTs on outgoing updates.

```
router bgp 1
address-family vpnv4
neighbor 2.2.2.2 route-map rtrewrite out
```

Feature History for MPLS VPN Route Target Rewrite

This table provides release and related information for features explained in this module.

These features are available on all releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Everest 16.6.1	MPLS VPN Route Target Rewrite	The MPLS VPN Route Target Rewrite feature can influence routing table updates by allowing the replacement of route targets on inbound and outbound Border Gateway Protocol (BGP) updates.
Cisco IOS XE Cupertino 17.7.1	MPLS VPN Route Target Rewrite	This feature was implemented on the C9500X-28C8D model.
Cisco IOS XE Dublin 17.10.1b	MPLS VPN Route Target Rewrite	This feature was implemented on the C9500X-60L4D model.

Use Cisco Feature Navigator to find information about platform and software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn.