



BGP Event-Based VPN Import

The BGP Event-Based VPN Import feature introduces a modification to the existing Border Gateway Protocol (BGP) path import process. The enhanced BGP path import is driven by events; when a BGP path changes, all of its imported copies are updated as soon as processing is available. Convergence times are significantly reduced because there is no longer any delay in the propagation of routes due to the software waiting for a periodic scanner time interval before processing the updates. To implement the new processing, new command-line interface (CLI) commands are introduced.

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Prerequisites for BGP Event-Based VPN Import

Cisco Express Forwarding or distributed Cisco Express Forwarding must be enabled on all participating routers.

Information About BGP Event-Based VPN Import

BGP Event-Based VPN Import

The BGP Event-Based VPN Import feature introduces a modification to the existing BGP path import process. BGP Virtual Private Network (VPN) import provides importing functionality for BGP paths where BGP paths are imported from the BGP VPN table into a BGP virtual routing and forwarding (VRF) topology. In the existing path import process, when path updates occur, the import updates are processed during the next scan time which is a configurable interval of 5 to 15 seconds. The scan time adds a delay in the propagation of routes. The enhanced BGP path import is driven by events; when a BGP path changes, all of its imported copies are updated as soon as processing is available.

Using the BGP Event-Based VPN Import feature, convergence times are significantly reduced because provider edge (PE) routers can propagate VPN paths to customer edge (CE) routers without the scan time delay.

Configuration changes such as adding imported route-targets to a VRF are not processed immediately, and are still handled during the 60-second periodic scanner pass.

Import Path Selection Policy

Event-based VPN import introduces three path selection policies:

- All—Import all available paths from the exporting net that match any route target (RT) associated with the importing VRF instance.
- Best path—Import the best available path that matches the RT of the VRF instance. If the best path in the exporting net does not match the RT of the VRF instance, a best available path that matches the RT of the VRF instance is imported.
- Multipath—Import the best path and all paths marked as multipaths that match the RT of the VRF instance. If there are no best path or multipath matches, then the best available path is selected.

Multipath and best path options can be restricted using an optional keyword to ensure that the selection is made only on the configured option. If the **strict** keyword is configured in the **import path selection** command, the software disables the fall back safety option of choosing the best available path. If no paths appropriate to the configured option (best path or multipath) in the exporting net match the RT of the VRF instance, then no paths are imported. This behavior matches the behavior of the software before the BGP Event-Based VPN Import feature was introduced.

When the restriction is not set, paths that are imported as the best available path are tagged. In **show** command output these paths are identified with the wording, “imported safety path.”

The paths existing in an exporting net that are considered for import into a VRF instance may have been received from another peer router and were not subject to the VPN importing rules. These paths may contain the same route-distinguisher (RD) information because the RD information is local to a router, but some of these paths do not match the RT of the importing VRF instance and are marked as “not-in-vrf” in the **show** command output. Any path that is marked as “not-in-vrf” is not considered as a best path because paths not in the VRF appear less attractive than paths in the VRF.

Import Path Limit

To control the memory utilization, a maximum limit of the number of paths imported from an exporting net can be specified per importing net. When a selection is made of paths to be imported from one or more exporting net, the first selection priority is a best path, the next selection priority is for multipaths, and the lowest selection priority is for nonmultipaths.

How to Configure BGP Event-Based VPN Import

Configuring a Multiprotocol VRF

Perform this task to configure a multiprotocol VRF that allows you to share route-target policies (import and export) between IPv4 and IPv6 or to configure separate route-target policies for IPv4 and IPv6 VPNs. In this task, only the IPv4 address family is configured, but we recommend using the multiprotocol VRF configuration for all new VRF configurations.



Note This task is not specific to the BGP Event-Based VPN Import feature.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **vrf definition** *vrf-name*
4. **rd** *route-distinguisher*
5. **route-target** {**import** | **export** | **both**} *route-target-ext-community*
6. **address-family ipv4** [**unicast**]
7. **exit-address-family**
8. **exit**
9. **interface** *type number*
10. **vrf forwarding** *vrf-name*
11. **ip address** *ip-address mask*
12. **no shutdown**
13. **exit**
14. Repeat Step 3 through Step 13 to bind other VRF instances with an interface.
15. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3	vrf definition <i>vrf-name</i> Example: <pre>Router(config)# vrf definition vrf-A</pre>	Configures a VRF routing table and enters VRF configuration mode. <ul style="list-style-type: none"> • Use the <i>vrf-name</i> argument to specify a name to be assigned to the VRF.
Step 4	rd <i>route-distinguisher</i> Example:	Creates routing and forwarding tables and specifies the default route distinguisher for a VPN.

	Command or Action	Purpose
	Router(config-vrf)# rd 45000:1	<ul style="list-style-type: none"> Use the <i>route-distinguisher</i> argument to add an 8-byte value to an IPv4 prefix to create a unique VPN IPv4 prefix.
Step 5	route-target {import export both} <i>route-target-ext-community</i> Example: Router(config-vrf)# route-target both 45000:100	Creates a route target extended community for a VRF. <ul style="list-style-type: none"> Use the import keyword to import routing information from the target VPN extended community. Use the export keyword to export routing information to the target VPN extended community. Use the both keyword to both import routing information from, and export routing information to, the target VPN extended community. Use the <i>route-target-ext-community</i> argument to add the route target extended community attributes to the VRF's list of import, export, or both (import and export) route target extended communities.
Step 6	address-family ipv4 [unicast] Example: Router(config-vrf)# address-family ipv4 unicast	Specifies the IPv4 address family and enters VRF address family configuration mode. <ul style="list-style-type: none"> This step is required here to specify an address family for the VRF defined in the previous steps.
Step 7	exit-address-family Example: Router(config-vrf-af)# exit-address-family	Exits VRF address family configuration mode and returns to VRF configuration mode.
Step 8	exit Example: Router(config-vrf)# exit	Exits VRF configuration mode and enters global configuration mode.
Step 9	interface type number Example: Router(config)# interface FastEthernet 1/1	Enters interface configuration mode.
Step 10	vrf forwarding vrf-name Example: Router(config-if)# vrf forwarding vrf-A	Associates a VRF instance with the interface configured in Step 9. <ul style="list-style-type: none"> When the interface is bound to a VRF, previously configured IP addresses are removed, and the interface is disabled.

	Command or Action	Purpose
Step 11	ip address <i>ip-address mask</i> Example: <pre>Router(config-if)# ip address 10.4.8.149 255.255.255.0</pre>	Configures an IP address for the interface.
Step 12	no shutdown Example: <pre>Router(config-if)# no shutdown</pre>	Restarts a disabled interface.
Step 13	exit Example: <pre>Router(config-if)# exit</pre>	Exits interface configuration mode and enters global configuration mode.
Step 14	Repeat Step 3 through Step 13 to bind other VRF instances with an interface.	--
Step 15	end Example: <pre>Router(config)# end</pre>	Exits global configuration mode and returns to privileged EXEC mode.

Configuring Event-Based VPN Import Processing for BGP Paths

Perform this task to reduce convergence times when BGP paths change by configuring event-based processing for importing BGP paths into a VRF table. Two new CLI commands allow the configuration of a maximum number of import paths per importing net and the configuration of a path selection policy.

Before you begin

This task assumes that you have previously configured the VRF to be used with the VRF address family syntax. To configure a VRF, see the “Configuring a Multiprotocol VRF” section earlier in this module.

Complete BGP neighbor configuration is also assumed. For an example configuration, see the “Example: Configuring Event-Based VPN Import Processing for BGP Paths” section in this module.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **address-family ipv4 vrf** *vrf-name*
5. **import path selection** {**all** | **bestpath** [**strict**] | **multipath** [**strict**]}
6. **import path limit** *number-of-import-paths*
7. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	enable Example: <pre>Router> enable</pre>	Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: <pre>Router# configure terminal</pre>	Enters global configuration mode.
Step 3	router bgp <i>autonomous-system-number</i> Example: <pre>Router(config)# router bgp 45000</pre>	Enters router configuration mode for the specified routing process.
Step 4	address-family ipv4 vrf <i>vrf-name</i> Example: <pre>Router(config-router)# address-family ipv4 vrf vrf-A</pre>	Specifies the IPv4 address family and enters address family configuration mode. <ul style="list-style-type: none"> • Use the vrf keyword and <i>vrf-name</i> argument to specify the name of the VRF instance to associate with subsequent IPv4 address family configuration mode commands.
Step 5	import path selection {all bestpath [strict] multipath [strict]} Example: <pre>Router(config-router-af)# import path selection all</pre>	Specifies the BGP path selection policy for importing routes into a VRF table. <ul style="list-style-type: none"> • In this example, all paths that match any RT of the VRF instance are imported.
Step 6	import path limit <i>number-of-import-paths</i> Example: <pre>Router(config-router-af)# import path limit 3</pre>	Specifies, per importing net, a maximum number of BGP paths that can be imported from an exporting net.
Step 7	end Example: <pre>Router(config-router-af)# end</pre>	Exits address family configuration mode and returns to privileged EXEC mode.

Monitoring and Troubleshooting BGP Event-Based VPN Import Processing

Perform the steps in this task as required to monitor and troubleshoot the BGP event-based VPN import processing.

Only partial command syntax for the **show** commands used in this task is displayed. For more details, see the *Cisco IOS IP Routing: BGP Command Reference*.

SUMMARY STEPS

1. **enable**
2. **show ip bgp vpnv4 {all | rd route-distinguisher | vrf vrf-name} [network-address [mask]]**
3. **show ip route [vrf vrf-name] [ip-address [mask]]**
4. **debug ip bgp vpnv4 unicast import {events | updates [access-list]}**

DETAILED STEPS

Procedure

Step 1

enable

Enables privileged EXEC mode. Enter your password if prompted.

Example:

```
Router> enable
```

Step 2

show ip bgp vpnv4 {all | rd route-distinguisher | vrf vrf-name} [network-address [mask]]

In this example output, a safe import path selection policy is in effect because the **strict** keyword is not configured using the **import path selection** command. When a path is imported as the best available path (when the bestpath or multipaths are not eligible for import), the path is marked with "imported safety path," as shown in the output.

Example:

```
Router# show ip bgp vpnv4 all 172.17.0.0

BGP routing table entry for 45000:1:172.17.0.0/16, version 10
Paths: (1 available, best #1, table vrf-A)
Flag: 0x820
  Not advertised to any peer
  2, imported safety path from 50000:2:172.17.0.0/16
    10.0.101.1 from 10.0.101.1 (10.0.101.1)
      Origin IGP, metric 200, localpref 100, valid, internal, best
      Extended Community: RT:45000:100
```

The paths existing in an exporting net that are considered for import into a VRF instance may have been received from another peer router and were not subject to the VPN importing rules. These paths may contain the same route-distinguisher (RD) information because the RD information is local to a router, but some of these paths do not match the RT of the importing VRF instance and are marked as "not-in-vrf" in the **show** command output.

In the following example output, a path was received from another peer router and was not subject to the VPN importing rules. This path, 10.0.101.2, was added to the VPNv4 table and associated with the vrf-A net because it contains a match of the RD information although the RD information was from the original router. This path is not, however, an RT match

for vrf-A and is marked as "not-in-vrf." Note that on the net for vrf-A, this path is not the bestpath because any paths that are not in the VRF appear less attractive than paths in the VRF.

Example:

```
Router# show ip bgp vpnv4 all 172.17.0.0

BBGP routing table entry for 45000:1:172.17.0.0/16, version 11
Paths: (2 available, best #2, table vrf-A)
Flag: 0x820
  Not advertised to any peer
  2
    10.0.101.2 from 10.0.101.2 (10.0.101.2)
      Origin IGP, metric 100, localpref 100, valid, internal, not-in-vrf
      Extended Community: RT:45000:200
      mpls labels in/out nolabel/16
  2
    10.0.101.1 from 10.0.101.1 (10.0.101.1)
      Origin IGP, metric 50, localpref 100, valid, internal, best
      Extended Community: RT:45000:100
      mpls labels in/out nolabel/16
```

Step 3 **show ip route [vrf vrf-name] [ip-address [mask]]**

In this example output, information about the routing table for VRF vrf-A is displayed:

Example:

```
Router# show ip route vrf vrf-A 172.17.0.0

Routing Table: vrf-A
Routing entry for 172.17.0.0/16
  Known via "bgp 1", distance 200, metric 50
  Tag 2, type internal
  Last update from 10.0.101.33 00:00:32 ago
Routing Descriptor Blocks:
  * 10.0.101.33 (default), from 10.0.101.33, 00:00:32 ago
    Route metric is 50, traffic share count is 1
    AS Hops 1
    Route tag 2
    MPLS label: 16
    MPLS Flags: MPLS Required
```

Step 4 **debug ip bgp vpnv4 unicast import {events | updates [access-list]}**

Use this command to display debugging information related to the importing of BGP paths into a VRF instance table. The actual output depends on the commands that are subsequently entered.

Note

If no access list to filter prefixes is specified when using the updates keyword, all updates for all prefixes are displayed and this may slow down your network.

Example:

```
Router# debug ip bgp vpnv4 unicast import events

BGP import events debugging is on
```


Configuration Examples for BGP Event-Based VPN Import

Example: Configuring Event-Based VPN Import Processing for BGP Paths

In this example, a VRF (vrf-A) is configured and VRF forwarding is applied to Fast Ethernet interface 1/1. In address family mode, the import path selection is set to all and the number of import paths is set to 3. Two BGP neighbors are configured under the IPv4 address family and activated under the VPNv4 address family.

```
vrf definition vrf-A
  rd 45000:1
  route-target import 45000:100
  address-family ipv4
    exit-address-family
  !
interface FastEthernet1/1
  no ip address
  vrf forwarding vrf-A
  ip address 10.4.8.149 255.255.255.0
  no shut
  exit
!
router bgp 45000
  network 172.17.1.0 mask 255.255.255.0
  neighbor 192.168.1.2 remote-as 40000
  neighbor 192.168.3.2 remote-as 50000
  address-family ipv4 vrf vrf-A
    import path selection all
    import path limit 3
  exit-address-family
  address-family vpnv4
    neighbor 192.168.1.2 activate
    neighbor 192.168.3.2 activate
  end
```

Additional References

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
BGP commands	Cisco IOS IP Routing: BGP Command Reference

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	http://www.cisco.com/cisco/web/support/index.html

Feature Information for BGP Event-Based VPN Import

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

Use Cisco Feature Navigator to find information about platform support and Cisco software image support. To access Cisco Feature Navigator, go to www.cisco.com/go/cfn. An account on Cisco.com is not required.

Table 1: Feature Information for BGP Event-Based VPN Import

Feature Name	Releases	Feature Information
BGP Event-Based VPN Import	Cisco IOS XE Release 2.6 Cisco IOS XE Release 3.3SG	<p>The BGP Event-Based VPN Import feature introduces a modification to the existing Border Gateway Protocol (BGP) path import process. The enhanced BGP path import is driven by events; when a BGP path changes, all of its imported copies are updated as soon as processing is available. Convergence times are significantly reduced because there is no longer any delay in the propagation of routes due to the software waiting for a periodic scanner time interval before processing the updates. To implement the new processing, new command-line interface (CLI) commands are introduced.</p> <p>The following commands were introduced or modified:</p> <ul style="list-style-type: none">• bgp scan-time• import path limit• import path selection• maximum-path ebgp• maximum-path ibgp• show ip bgp vpnv4• show ip bgp vpnv6

