BGP Best External

The BGP Best External feature provides the network with a backup external route to avoid loss of connectivity of the primary external route. The BGP Best External feature advertises the most preferred route among those received from external neighbors as a backup route. This feature is beneficial in active-backup topologies, where service providers use routing policies that cause a border router to choose a path received over an Interior Border Gateway Protocol (iBGP) session (of another border router) as the best path for a prefix even if it has an Exterior Border Gateway Protocol (eBGP) learned path. This active-backup topology defines one exit or egress point for the prefix in the autonomous system and uses the other points as backups if the primary link or eBGP peering is unavailable. The policy causes the border router to hide the paths learned over its eBGP sessions from the autonomous system because it does not advertise any path for such prefixes. To cope with this situation, some devices advertise one externally learned path called the best external path.

Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table at the end of this module.

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.

Prerequisites for BGP Best External

- The Bidirectional Forwarding Detection (BFD) protocol must be enabled to quickly detect link failures.

- Ensure that the BGP and theMultiprotocol Label Switching (MPLS) network is up and running with the customer site connected to the provider site by more than one path (multihomed).

- The backup path must have a unique next hop that is not the same as the next hop of the best path.

- BGP must support lossless switchover between operational paths.

Restrictions for BGP Best External

- The BGP Best External feature will not install a backup path if BGP Multipath is installed and a multipath exists in the BGP table. One of the multipaths automatically acts as a backup for the other paths.

- The BGP Best External feature is not supported with the following features:

    - MPLS VPN Carrier Supporting Carrier

    - MPLS VPN Inter-Autonomous Systems, option B

    - MPLS VPN Per Virtual Routing and Forwarding (VRF) Label

- The BGP Best External feature cannot be configured with Multicast or L2VPN VRF address families.

- The BGP Best External feature cannot be configured on a route reflector, unless it is running Cisco IOS XE Release 3.4S or later.

- The BGP Best External feature does not support NSF/SSO. However, ISSU is supported if both Route Processors have the BGP Best External feature configured.

- The BGP Best External feature can only be configured on VPNv4, VPNv6, IPv4 VRF, and IPv6 VRF address families.

- When you configure the BGP Best External feature using the **bgp advertise-best-external** command, you need not enable the BGP PIC feature with the **bgp additional-paths install** command. The BGP PIC feature is automatically enabled by the BGP Best External feature.

- When you configure the BGP Best External feature, it will override the functionality of the "MPLS VPN--BGP Local Convergence" feature. However, you do not have to remove the **protection local-prefixes** command from the configuration.

Information About BGP Best External

BGP Best External Overview

Service providers use routing policies that cause a border router to choose a path received over an iBGP session (of another border router) as the best path for a prefix even if it has an eBGP learned path. This practice

is popularly known as active-backup topology and is done to define one exit or egress point for the prefix in the autonomous system and to use the other points as backups if the primary link or eBGP peering is unavailable.

The policy, though beneficial, causes the border router to hide the paths learned over its eBGP sessions from the autonomous system because the border router does not advertise any path for such prefixes. To cope with this situation, some routers advertise one externally learned path called the best external path. The best external behavior causes the BGP selection process to select two paths to every destination:

- The best path is selected from the complete set of routes known to that destination.

- The best external path is selected from the set of routes received from its external peers.

BGP advertises the best path to external peers. Instead of withdrawing the best path from its internal peers when it selects an iBGP path as the best path, BGP advertises the best external path to the internal peers.

The BGP Best External feature is an essential component of the Prefix-Independent Convergence (PIC) edge for both Internet access and MPLS VPN scenarios and makes alternate paths available in the network in the active-backup topology.

What the Best External Route Means

The BGP Best External feature uses a "best external route" as a backup path, which, according to draft-marques-idr-best-external, is the most preferred route among those received from external neighbors. The most preferred route from external neighbors can be the following:

- Two routers in different clusters that have an Interior Border Gateway Protocol (iBGP) session between them.

- Two routers in different autonomous systems of a confederation that have an External Border Gateway Protocol (eBGP) session between them.

The best external route might be different from the best route installed in the Routing Information Base (RIB). The best route could be an internal route. By allowing the best external route to be advertised and stored, in addition to the best route, networks gain faster restoration of connectivity by providing additional paths that may be used if the primary path fails.

How the BGP Best External Feature Works

The BGP Best External feature is based on Internet Engineering Task Force (IETF) draft-marques-idr-best-external.txt. The BGP Best External feature advertises a best external route to its internal peers as a backup route. The backup route is stored in the RIB and Cisco Express Forwarding. If the

primary path fails, the BGP PIC functionality enables the best external path to take over, enabling faster restoration of connectivity.

Figure 1: MPLS VPN: Best External at the Edge of MPLS VPN

The figure above shows an MPLS VPN using the BGP Best External feature. The network includes the following components:

- eBGP sessions exist between the provider edge (PE) and customer edge (CE) routers.

- PE1 is the primary router and has a higher local preference setting.

- Traffic from CE2 uses PE1 to reach router CE1.

- PE1 has two paths to reach CE1.

- CE1 is dual-homed with PE1 and PE2.

- PE1 is the primary path and PE2 is the backup path.

In the figure above, traffic in the MPLS cloud flows through PE1 to reach CE1. Therefore, PE2 uses PE1 as the best path and PE2 as the backup path.

PE1 and PE2 are configured with the BGP Best External feature. BGP computes both the best path (the PE1-CE1 link) and a backup path (PE2) and installs both paths into the RIB and Cisco Express Forwarding. The best external path (PE2) is advertised to the peer routers, in addition to the best path.

When Cisco Express Forwarding detects a link failure on the PE1-CE1 link, Cisco Express Forwarding immediately switches to the backup path PE2. Traffic is quickly rerouted due to local Fast Convergence in Cisco Express Forwarding using the backup path. Thus, traffic loss is minimized and fast convergence is achieved.

Configuration Modes for Enabling BGP Best External

You can enable the BGP Best External feature in different modes, each of which protects Virtual Routing and Forwarding (VRF) in its own way:

- If you issue the **bgp advertise-best-external** command in VPNv4 address family configuration mode, it applies to all IPv4 VRFs. If you issue the command in this mode, you need not issue it for specific VRFs.

- If you issue the **bgp advertise-best-external** command in IPv4 address family configuration mode, it applies only to that VRF.

BGP Best External Path on RR for Intercluster

Beginning with Cisco IOS XE Release 3.4S, BGP Best External is extended to BGP Best External for Intercluster RRs. This feature provides path diversity between RR clusters, providing best external functionality toward non-client iBGP peers. The feature is also known as the "intercluster best external path."

Best external path at an RR means the best path within the RR's cluster. This path might also be referred to as the best internal path.

When an RR (RR1) chooses a non-client iBGP path (that is, a path learned from another RR, let's say RR2) as its overall best, with the BGP Best External for Intercluster RRs feature, RR1 will be able to advertise its best internal path to the non-client iBGP peers. This will help RR2 to learn an additional path, providing a diverse path.

Best external functionality at RRs is only for non-client iBGP peers. An RR cannot advertise best external paths to its clients because it has to advertise its overall bestpath (which can be either a client path or non-client or eBGP path).

The best external path calculated by the RR is the best internal path for the cluster. It will be advertised to the non-client iBGP peers only when the overall best path at this RR is a non-client iBGP path.

When there are multiple RRs, each in its own cluster, each RR must have the **neighbor advertise best-external** command configured for each of its neighbor RRs.

If the RR is in the forwarding plane, the **bgp additional paths install** command is necessary.

CLI Differences for Best External Path on an RR for Intercluster

Prior to Cisco IOS XE Release 3.4S, the BGP Best External feature was allowed on a PE only, and it was configured by the **bgp advertise-best-external** command. The calculation of the backup path, installation, and advertisement were tied together in one command.

Beginning with Cisco IOS XE Release 3.4S, the BGP Best External feature is allowed on PEs and RRs. The functionality of the **bgp advertise-best-external** command is divided among the following three commands that calculate, install, and advertise the best external path:

- **bgp additional-path select best-external**

- **bgp additional-path install**

- **neighbor advertise diverse-path best-external**

If the **bgp additional-path select best-external** command is not configured, the system will calculate and install the best external path, but not advertise it.

The **neighbor advertise diverse-path best-external** command enables the advertisement of the best external path to the specified neighbor.

Rules Used to Calculate the BGP Best External Path for Intercluster RRs

The best internal path implementation on an RR toward non-clients (different cluster RRs) is calculated based on the following rules:

1 Calculate the overall primary bestpath on the RR per the normal bestpath selection rules.

2 If a backup path configuration is enabled, calculate the second bestpath (which is a different path from the primary bestpath selected in Rule 1 and has a different nexthop from this bestpath), which is marked as the backup path. Backup path selection is enabled using the **bgp additional-paths install** or **bgp additional-paths select [best-external] [backup]** command.

3 If the overall best path on the RR is a non-client iBGP path and not an eBGP path, calculate the best external/internal path from the remaining paths after excluding results from Rule 1 and Rule 2 and by ignoring all the other paths from the other clusters and run normal bestpath rules by including all the remaining eBGP and iBGP paths. Select the newly obtained bestpath and mark it as the best internal path.

4 Advertise this best internal path, which is either eBGP (received from CE peers for RR/ASBR) or iBGP (received from RR clients) toward the non-client RRs when **neighbor advertise best-external** is configured towards the non-client RRs.

5 If the overall bestpath is a path received from either an RR client or eBGP peer (in case of RR/ASBR) either an iBGP or an eBGP path will be chosen as bestpath per the normal bestpath algorithm. Because the overall bestpath is an internal client path, the normal advertisement rules will automatically advertise this path to non-client iBGP peers/RRs. This behavior is the same as the existing behavior (when best external is not enabled on RRs) when an RR client's path is chosen as the overall bestpath.

6 We do not allow a best external path to be configured on an RR towards RR-clients. The **neighbor advertise best-external** command can be configured on RR/ASBR only for non-clients or peering with RRs in the other clusters.

7 When multipath is enabled on the RR and only when the overall bestpath is from a non-client and if some of the intracluster client paths are also marked as multipaths, when best external is enabled on the RR (**neighbor advertise best-external** towards the RR non-client), the algorithm selects the older multipath among the intra-cluster client multipaths (paths obtained from RR clients and eBGP peers within the cluster) and marks it as best internal path and announces it to the non-clients as best external path, so that the non-clients get path diversity from this cluster. If there are no intra-cluster multipaths found, we choose the best external path per Rules 3 through 5.

How to Configure BGP Best External

Configuring the BGP Best External Feature

Perform the following task to configure the BGP Best External feature. This task shows how to configure the BGP Best External feature in either an IPv4 or VPNv4 address family. In VPNv4 address family configuration mode, the BGP Best External feature applies to all IPv4 Virtual Routing Forwarding (VRF); you need not configure it for specific VRFs. If you issue the **bgp advertise-best-external** command in IPv4 VRF address family configuration mode, the BGP Best External feature applies only to that VRF.

Before You Begin

- Configure the MPLS VPN and verify that it is working properly before configuring the BGP Best External feature. See the "Configuring MPLS Layer 3 VPNs" section for more information.

- Configure multiprotocol VRFs to allow you to share route-target policies (import and export) between IPv4 and IPv6 or configure separate route-target policies for IPv4 and IPv6 VPNs. For information about configuring multiprotocol VRFs, see the "MPLS VPN--VRF CLI for IPv4 and IPv6 VPNs section".

- Ensure that the customer edge (CE) router is connected to the network by at least two paths.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. Do one of the following:

    - **address-family ipv4** [**unicast** | **vrf** *vrf-name*]

    - or

    - **address-family vpnv4** [**unicast**]

    - or

5. **bgp advertise-best-external**
6. **neighbor** *ip-address* **remote-as** *autonomous-system-number*
7. **neighbor** *ip-address* **activate**
8. **neighbor** *ip-address* **fall-over** [**bfd** | **route-map** *map-name*]
9. **end**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.

	Command or Action	Purpose
Step 3	**router bgp** *autonomous-system-number* **Example:** Router(config)# router bgp 40000	Enters router configuration mode for the specified routing process.

Step 4	Do one of the following:
	
	    • **address-family ipv4** [**unicast** | **vrf** *vrf-name*]
	
	    • or
	
	    • **address-family vpnv4** [**unicast**]
	
	    • or
	
	Example:
	
	Router(config-router)# address-family ipv4 unicast
	
	Example:
	
	Router(config-router)# address-family vpnv4
		Specifies the IPv4 or VPNv4 address family and enters address family configuration mode.
		
		• The **unicast** keyword specifies the IPv4 or VPNv4 unicast address family.
		
		• The **vrf** keyword and *vrf-name* argument specify the name of the VRF instance to associate with subsequent IPv4 address family configuration mode commands.

Step 5	**bgp advertise-best-external** **Example:** Router(config-router-af)# bgp advertise-best-external	Calculates and uses an external backup path and installs it into the RIB and Cisco Express Forwarding.
Step 6	**neighbor** *ip-address* **remote-as** *autonomous-system-number* **Example:** Router(config-router-af)# neighbor 192.168.1.1 remote-as 45000	Adds the IP address of the neighbor in the specified autonomous system to the IPv4 multiprotocol BGP neighbor table of the local router. • By default, neighbors that are defined using the **neighbor remote-as** command in router configuration mode exchange only IPv4 unicast address prefixes. To exchange other address prefix types, neighbors must also be activated using the **neighbor activate** command in address family configuration mode for the other prefix types.
Step 7	**neighbor** *ip-address* **activate** **Example:** Router(config-router-af)# neighbor 192.168.1.1 activate	Enables the neighbor to exchange prefixes for the IPv4 unicast address family with the local router.

	Command or Action	**Purpose**
Step 8	**neighbor** *ip-address* **fall-over** [**bfd**	**route-map** *map-name*] **Example:** `Router(config-router-af)# neighbor 192.168.1.1 fall-over bfd`	Configures the BGP peering to use fast session deactivation and enables BFD protocol support for failover. • BGP will remove all routes learned through this peer if the session is deactivated.
Step 9	**end** **Example:** `Router(config-router-af)# end`	(Optional) Exits address family configuration mode and returns to privileged EXEC mode.

Verifying the BGP Best External Feature

Perform the following task to verify that the BGP Best External feature is configured correctly.

SUMMARY STEPS

1. **enable**
2. **show vrf detail**
3. **show ip bgp ipv4** **mdt** **all** | **rd** **vrf**} | **multicast** | **tunnel unicast** or **show ip bgp vpn4 all rd** *route-distinguisher* | **vrf** *vrf-name* **rib-failure** *ip-prefix/length* **longer-prefixes**]] *network-address mask* **longer-prefixes**]] **cidr-only** **community** *community-list* **dampened-paths** **filter-list**] [**flap-statistics** **inconsistent-as** **neighbors** **paths** **line**]] **peer-group** **quote-regexp** **regexp**] [**summary** **labels**
4. **show bgp vpnv4 unicast vrf** *vrf-name ip-address*
5. **show ip route vrf** *vrf-name* **repair-paths** *ip-address*
6. **show ip cef vrf** *vrf-name ip-address* **detail**

DETAILED STEPS

Step 1 **enable**
Use this command to enable privileged EXEC mode. Enter your password, if prompted. For example:

Example:

```
Router> enable
Router#
```

Step 2 **show vrf detail**
Use this command to verify that the BGP Best External feature is enabled. The following **show vrf detail** command output shows that the BGP Best External feature is enabled.

Example:

```
Router# show vrf detail
VRF test1 (VRF Id = 1); default RD 400:1; default VPNID <not set>
  Interfaces:
    Se4/0
Address family ipv4 (Table ID = 1 (0x1)):
  Export VPN route-target communities
    RT:100:1                RT:200:1                RT:300:1
    RT:400:1
  Import VPN route-target communities
    RT:100:1                RT:200:1                RT:300:1
    RT:400:1
  No import route-map
  No export route-map
  VRF label distribution protocol: not configured
  VRF label allocation mode: per-prefix

 Prefix protection with additional path enabled
Address family ipv6 not active.
```

Step 3   **show ip bgp ipv4 mdt all** | **rd vrf**} | **multicast** | **tunnel unicast** or **show ip bgp vpn4 all rd** *route-distinguisher* |
vrf *vrf-name* **rib-failure** *ip-prefix/length* **longer-prefixes**]] *network-address mask* **longer-prefixes**]] **cidr-only**
community *community-list* **dampened-paths filter-list**] [**flap-statistics inconsistent-as neighbors paths line**]]
peer-group quote-regexp regexp] [**summary labels**

Use this command to verify that the best external route is advertised. In the command output, the code b indicates a
backup path and the code x designates the best external path.

Example:

```
Router# show ip bgp vpnv4 all
BGP table version is 1104964, local router ID is 10.2.2.2
Status codes: s suppressed, d damped, h history, * valid, > best, i - internal,
              r RIB-failure, S Stale, multipath,
b backup-path, x best-external
Origin codes: i - IGP, e - EGP, ? - incomplete
   Network         Next Hop         Metric LocPrf Weight Path
Route Distinguisher: 11:12 (default for vrf blue)
*>i1.0.0.1/32      10.10.3.3            0     200     0 1 ?
* i                10.10.3.3            0     200     0 1 ?
*                  10.0.0.1                            0 1 ?
*bx                10.0.0.1            0              0 1 ?
*                  10.0.0.1                            0 1 ?
```

Step 4   **show bgp vpnv4 unicast vrf** *vrf-name ip-address*
Use this command to verify that the best external route is advertised.

Example:

```
Router# show bgp vpnv4 unicast vrf vpn1 10.10.10.10
BGP routing table entry for 10:10:10.10.10.10/32, version 10
Paths: (2 available, best #1, table vpn1)
  Advertise-best-external
  Advertised to update-groups:
    1        2
  200
    10.6.6.6 (metric 21) from 10.6.6.6 (10.6.6.6)
    Origin incomplete, metric 0, localpref 200, valid, internal, best
    Extended Community: RT:1:1
    mpls labels in/out 23/23
  200
    10.1.2.1 from 10.1.2.1 (10.1.1.1)
```

```
        Origin incomplete, metric 0, localpref 100, valid,
external, backup/repair,     advertise-best-external
      Extended Community: RT:1:1 , recursive-via-connected
      mpls labels in/out 23/nolabel
```

Step 5   **show ip route vrf** *vrf-name* **repair-paths** *ip-address*
Use this command to display the repair route.

Example:

```
Router# show ip route vrf vpn1 repair-paths

Routing Table: vpn1
Codes: L - local, C - connected, S - static, R - RIP, M - mobile, B - BGP
       D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
       N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
       E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
       ia - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route, H - NHRP
       + - replicated route, % - next hop override
Gateway of last resort is not set
       10.0.0.0/8 is variably subnetted, 2 subnets, 2 masks
B        10.1.1.0/24 [200/0] via 10.6.6.6, 00:38:33
                    [RPR][200/0] via 10.1.2.1, 00:38:33
B        10.1.1.1/32 [200/0] via 10.6.6.6, 00:38:33
                    [RPR][200/0] via 10.1.2.1, 00:38:33
       10.0.0.0/8 is variably subnetted, 3 subnets, 2 masks
C        10.1.2.0/24 is directly connected, Ethernet0/0
L        10.1.2.2/32 is directly connected, Ethernet0/0
B        10.1.6.0/24 [200/0] via 10.6.6.6, 00:38:33
                    [RPR][200/0] via 10.1.2.1, 00:38:33
```

Step 6   **show ip cef vrf** *vrf-name ip-address* **detail**
Use this command to display the best external route.

Example:

```
Router# show ip cef vrf test 10.71.8.164 detail

10.71.8.164/30, epoch 0, flags rib defined all labels
 recursive via 10.249.0.102 label 35
   nexthop 10.249.246.101 Ethernet0/0 label 25
 recursive via 10.249.0.104 label 28,
repair
   nexthop 10.249.246.101 Ethernet0/0 label 24
```

Configuring Best External Path on an RR for an Intercluster

Perform the following task to configure a best external path on an RR for an intercluster. The steps in this particular task configure RR1 in the figure below, in the IPv4 address family. The step that configures address family lists the other address families supported.

Figure 2: Scenario for Configuring a BGP Best External Path on a RR for an Intercluster
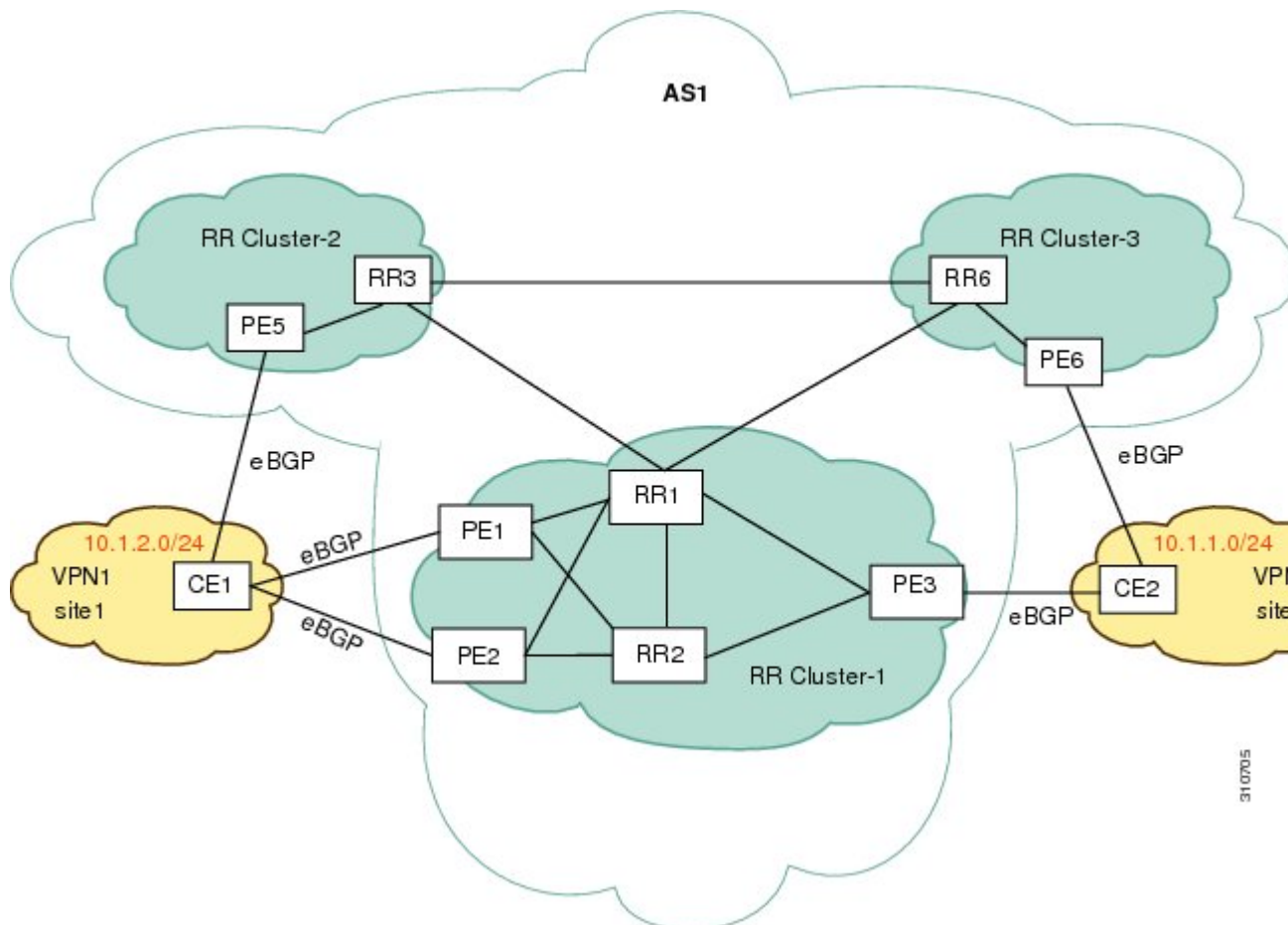
SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **neighbor** *ip-address* **remote-as** *autonomous-system-number*
5. **neighbor** *ip-address* **remote-as** *autonomous-system-number*
6. **address-family ipv4 unicast**
7. **neighbor** *ip-address* **activate**
8. **neighbor** *ip-address* **activate**
9. **bgp additional-paths select best-external**
10. **bgp additional-paths install**
11. **neighbor** *ip-address* **advertise best-external**
12. **neighbor** *ip-address* **advertise best-external**
13. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**router bgp** *autonomous-system-number* **Example:** `Router(config)# router bgp 1`	Enters router configuration mode for the specified routing process.
Step 4	**neighbor** *ip-address* **remote-as** *autonomous-system-number* **Example:** `Router(config-router)# neighbor 10.5.1.1 remote-as 1`	Adds an entry to the BGP or multiprotocol BGP neighbor table. • This step is for RR3.
Step 5	**neighbor** *ip-address* **remote-as** *autonomous-system-number*	Adds an entry to the BGP or multiprotocol BGP neighbor table.

	Command or Action	Purpose
		• This step is for RR6.
	Example: Router(config-router)# neighbor 10.5.1.2 remote-as 1	
Step 6	**address-family ipv4 unicast** **Example:** Router(config-router)# address-family ipv4 unicast	Specifies the address family and enters address family configuration mode. • Supported address families are ipv4 unicast, vpnv4 unicast, ipv6 unicast, vpnv6 unicast, ipv4+label, and ipv6+label.
Step 7	**neighbor** *ip-address* **activate** **Example:** Router(config-router-af)# neighbor 10.5.1.1 activate	Enables the exchange of information with a BGP neighbor. • This step is for RR3.
Step 8	**neighbor** *ip-address* **activate** **Example:** Router(config-router-af)# neighbor 10.5.1.2 activate	Enables the exchange of information with a BGP neighbor. • This step is for RR6.
Step 9	**bgp additional-paths select best-external** **Example:** Router(config-router-af)# bgp additional-paths select best-external	Configures the system to calculate a best external path (external to RR cluster).
Step 10	**bgp additional-paths install** **Example:** Router(config-router-af)# bgp additional-paths install	Enables BGP to calculate a backup path for a given address family and to install it into the RIB and CEF. • This step is necessary if the RR is enabled for forwarding (the RR is in the forwarding plane). Otherwise, this step is unnecessary.
Step 11	**neighbor** *ip-address* **advertise best-external** **Example:** Router(config-router-af)# neighbor 10.5.1.1 advertise best-external	(Optional) Configures a neighbor to receive the best external path in an advertisement. • This step is for RR3.
Step 12	**neighbor** *ip-address* **advertise best-external** **Example:** Router(config-router-af)# neighbor 10.5.1.2 advertise best-external	(Optional) Configures a neighbor to receive the best external path in an advertisement. • This step is for RR6.

	Command or Action	Purpose
Step 13	**end** **Example:** Router(config-router-af)# end	(Optional) Exits address family configuration mode and returns to privileged EXEC mode.

In the scenario shown above, the following paths are selected as best path, backup bath, and best internal path on the three RRs located in the three different clusters:

On RR1:

To Reach Prefix 10/8	Next Hop:
	PE5 (best path, local preference = 200)
	PE3 (backup path, local preference = 150)
	PE3 (best internal path, local preference = 150)

On RR3:

To Reach Prefix 10/8	Next Hop:
	PE5 (best path, local preference = 200)
	PE6 (backup path, local preference = 50)
	PE3 (received as best external path from RR1, local preference = 150)

On RR6:

To Reach Prefix 10/8	Next Hop:
	PE5 (best path, local preference = 200)
	PE6 (backup path, local preference = 50)
	PE3 (received as best external path from RR1, local preference = 150)

Configuration Examples for BGP Best External

Example: Configuring the BGP Best External Feature

The following example shows how to configure the BGP Best External feature in VPNv4 mode:

```
vrf definition test1
 rd 400:1
 route-target export 100:1
 route-target export 200:1
 route-target export 300:1
 route-target export 400:1
 route-target import 100:1
 route-target import 200:1
 route-target import 300:1
 route-target import 400:1
 address-family ipv4
 exit-address-family
 exit
!
interface Ethernet1/0
 vrf forwarding test1
 ip address 10.0.0.1 255.0.0.0
 exit
!
router bgp 64500
 no synchronization
 bgp log-neighbor-changes
 neighbor 10.5.5.5 remote-as 64500
 neighbor 10.5.5.5 update-source Loopback0
 neighbor 10.6.6.6 remote-as 64500
 neighbor 10.6.6.6 update-source Loopback0
 no auto-summary
 !
 address-family vpnv4

bgp advertise-best-external
  neighbor 10.5.5.5 activate
  neighbor 10.5.5.5 send-community extended
  neighbor 10.6.6.6 activate
  neighbor 10.6.6.6 send-community extended
 exit-address-family
 !
 address-family ipv4 vrf test1
  no synchronization
bgp recursion host
  neighbor 192.168.13.2 remote-as 64511
  neighbor 192.168.13.2 fall-over bfd
  neighbor 192.168.13.2 activate
  neighbor 192.168.13.2 as-override
 exit-address-family
```

Example: Configuring a Best External Path on an RR for an Intercluster

The following example configures RR1 in the figure shown in the "Configuring a Best External Path on an RR for an Intercluster" section. RR1 is configured to calculate, install, and advertise the best external path to its intercluster RR neighbors.

RR1

```
router bgp 1
 neighbor 10.5.1.1 remote-as 1
```

```
neighbor 10.5.1.2 remote-as 1
address-family ipv4 unicast
neighbor 10.5.1.1 activate
neighbor 10.5.1.2 activate
bgp additional-paths select best-external
bgp additional-paths install
neighbor 10.5.1.1 advertise best-external
neighbor 10.5.1.2 advertise best-external
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
Basic MPLS VPNs	"Configuring MPLS Layer 3 VPNs" module in the *MPLS: Layer 3 VPNs Configuration Guide*
Multiprotocol VRFs	"MPLS VPN VRF CLI for IPv4 and IPv6 VPNs" module in the *MPLS: Layer 3 VPNs Configuration Guide*
A failover feature that creates a new path after a link or node failure	MPLS VPN--BGP Local Convergence

Standards

Standard	Title
draft-marques-idr-best-external	*BGP Best External, Advertisement of the best external route to iBGP*

MIBs

MIB	MIBs Link
—	To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
RFC 1771	*A Border Gateway Protocol 4 (BGP-4)*
RFC 2547	*BGP/MPLS VPNs*

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 Best External

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 Best External

Feature Name	Releases	Feature Information
BGP Best External	Cisco IOS XE Release 3.2S	The BGP Best External feature provides the network with a backup external route to avoid loss of connectivity of the primary external route. This feature advertises the most preferred route among those received from external neighbors as a backup route. In Cisco IOS XE Release 3.2S, this feature was introduced. The following commands were introduced or modified: **bgp advertise-best-external**, **bgp recursion host**, **show ip bgp**, **show ip bgp vpnv4**, **show ip cef**, **show ip cef vrf**, **show ip route**, **show ip route vrf**
BGP Best External Path on an RR for Intercluster	Cisco IOS XE Release 3.4S	The BGP Best External Path on RR for Intercluster feature provides path diversity between RR clusters. The feature provides best external functionality toward non-client iBGP peers, and is also known as "intercluster best external path." The following commands were introduced: **bgp additional-pathsselect**, **neighbor advertise best-external**.