BGP-MVPN SAFI 129 IPv6

Subsequent Address Family Identifier (SAFI) 129, known as VPN Multicast SAFI, provides the capability to support multicast routing in the service provider's core IPv6 network.

Border Gateway Protocol (BGP) Multicast Virtual Private Network (MVPN) provides a means for service providers to use different encapsulation methods (generic routing encapsulation [GRE], Multicast Label Distribution Protocol [MLDP], and ingress replication) for forwarding MVPN multicast data traffic in the service provider network.

The BGP-MVPN SAFI 129 IPv6 feature is required to support BGP-based MVPNs.

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• Additional References, page 8
• Feature Information for BGP-MVPN SAFI 129 IPv6, page 9

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-MVPN SAFI 129 IPv6

• Before you configure a SAFI 129 IPv6-related address family, the ipv6 unicast-routing command must be configured on the device.
To create a multicast IPv6 VRF address family under BGP, IPv6 must first be activated on the VRF itself.

**Note** There is no separate multicast configuration on the VRF. Configuring the `address-family ipv6` command on the VRF will enable both unicast and multicast topologies.

If you want prefixes to be installed into the Routing Information Base (RIB), you must configure the `pim` command on a VRF interface.

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**Information About BGP-MVPN SAFI 129 IPv6**

**Overview of BGP-MVPN SAFI 129 IPv6**

MVPN utilizes the existing VPN infrastructure to allow multicast traffic to pass through the provider space. Information derived from VPN routes is one of the components needed to set up tunnels within the core. Currently, multicast traffic will derive this information from the unicast VPNv6 tables, which forces multicast traffic to be dependent on unicast topologies.

For scenarios in which multicast and unicast traffic would be better suited with separate topologies, the customer edge (CE) router may advertise a special set of routes to be used exclusively for multicast VPNs. Multicast routes learned from the CE router can be propagated to remote provider edge (PE) routers via SAFI 129. Multicast routes learned from the CE router or multicast VPN routes learned from remote PE routers can now be installed directly into the multicast RIB, instead of using replicated routes from the unicast RIB. Maintaining separate routes and entries for unicast and multicast allows you to create differing topologies for each service within the core.
How to Configure BGP-MVPN SAFI 129 IPv6

Configuring BGP-MVPN SAFI 129 IPv6

SUMMARY STEPS

1. enable
2. configure terminal
3. vrf definition vrf1
4. rd route-distinguisher
5. route-target export route-target-ext-community
6. route-target import route-target-ext-community
7. address-family ipv6
8. mdt default group-address
9. exit
10. exit
11. router bgp autonomous-system-number
12. address-family vpnv6 multicast
13. neighbor peer-group-name send-community extended
14. neighbor {ip-address | peer-group-name | ipv6-address %} activate
15. address-family ipv6 multicast vrf vrf-name
16. end

DETAILED STEPS

<table>
<thead>
<tr>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Step 1</strong> enable</td>
<td>Enables privileged EXEC mode.</td>
</tr>
<tr>
<td>Example: Device&gt; enable</td>
<td>• Enter your password if prompted.</td>
</tr>
<tr>
<td><strong>Step 2</strong> configure terminal</td>
<td>Enters global configuration mode.</td>
</tr>
<tr>
<td>Example: Device# configure terminal</td>
<td></td>
</tr>
<tr>
<td><strong>Step 3</strong> vrf definition vrf1</td>
<td>Defines a VRF instance and enters VRF configuration mode.</td>
</tr>
<tr>
<td>Example: Device(config)# vrf definition vrf1</td>
<td></td>
</tr>
<tr>
<td>Step</td>
<td>Command or Action</td>
</tr>
<tr>
<td>------</td>
<td>------------------</td>
</tr>
<tr>
<td>4</td>
<td>rd route-distinguisher</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf)# rd 1:1</td>
</tr>
<tr>
<td>5</td>
<td>route-target export route-target-ext-community</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf)# route-target export 1:1</td>
</tr>
<tr>
<td>6</td>
<td>route-target import route-target-ext-community</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf)# route-target import 1:1</td>
</tr>
<tr>
<td>7</td>
<td>address-family ipv6</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf)# address-family ipv6</td>
</tr>
<tr>
<td>8</td>
<td>mdt default group-address</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf-af)# mdt default 239.0.0.1</td>
</tr>
<tr>
<td>9</td>
<td>exit</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf-af)# exit</td>
</tr>
<tr>
<td>10</td>
<td>exit</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config-vrf)# exit</td>
</tr>
<tr>
<td>11</td>
<td>router bgp autonomous-system-number</td>
</tr>
<tr>
<td></td>
<td>Example: Device(config)# router bgp 50000</td>
</tr>
<tr>
<td>Step 12</td>
<td>Command or Action</td>
</tr>
<tr>
<td>---------</td>
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</tr>
<tr>
<td></td>
<td>address-family</td>
</tr>
<tr>
<td></td>
<td>vpnv6 multicast</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
</tr>
<tr>
<td></td>
<td>Device(config-router)# address-family vpnv6 multicast</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 13</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>neighbor peer-group-name send-community extended</td>
<td>Specifies that a communities attribute should be sent to a BGP neighbor.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device(config-router-af)# neighbor client1 send-community extended</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 14</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>neighbor ip-address</td>
<td>Enables the neighbor to exchange prefixes for the specified family type with the neighbor and the local router.</td>
</tr>
<tr>
<td></td>
<td>activate</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Router(config-router-af)# neighbor 2001:DB8:0:CC00::1 % activate</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 15</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>address-family</td>
<td>Configures a routing session using IPv6 multicast address prefixes for a VRF instance.</td>
</tr>
<tr>
<td></td>
<td>ipv6 multicast</td>
<td></td>
</tr>
<tr>
<td></td>
<td>vrf vrf-name</td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device(config-router-af)# address-family ipv6 multicast vrf vrf1</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Step 16</th>
<th>Command or Action</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>end</td>
<td>Exits address family configuration mode and returns to privileged EXEC mode.</td>
</tr>
<tr>
<td></td>
<td><strong>Example:</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Device(config-router-af)# end</td>
<td></td>
</tr>
</tbody>
</table>

### Configuration Examples for BGP-MVPN SAFI 129 IPv6

#### Example: Configuring BGP-MVPN SAFI 129 IPv6

The example below shows the configuration for a PE router:

```
hostname PE1
!
! vrf definition blue
rd 55:1111
route-target export 55:1111
route-target import 55:1111
```
address-family ipv6
  mdt default 232.1.1.1
  mdt data 232.1.200.0 0.0.0.0
exit-address-family
!
ip multicast-routing
ip multicast-routing vrf blue
ip cef
!
ipv6 unicast-routing
ipv6 multicast-routing
ipv6 multicast-routing vrf blue
ipv6 cef
!
interface Loopback0
  ip address 205.1.0.1 255.255.255.255
  ip pim sparse-dense-mode
ipv6 address FE80::205:1:1 link-local
ipv6 address 205::1:1:1/64
ipv6 enable
!
interface Ethernet0/0
  ! interface connect to the core vpn
  bandwidth 1000
  ip address 30.3.0.1 255.255.255.0
  ip pim sparse-dense-mode
  delay 100
  ipv6 address FE80::70:1:1 link-local
  ipv6 address 70::1:1:1/64
  ipv6 enable
  mpls ip
!
interface Ethernet1/1
  ! interface connect to CE (vrf interface)
  bandwidth 1000
  vrf forwarding blue
  ip address 10.1.0.1 255.255.255.0
  ip pim sparse-dense-mode
  delay 100
  ipv6 address FE80::20:1:1 link-local
  ipv6 address 20::1:1:1/64
  ipv6 enable
!
router ospf 200
  redistribute connected subnets
  redistribute bgp 55 metric 10
  passive-interface Loopback0
  network 30.3.0.0 0.0.255.255 area 1
!
routing bgp 55
  bgp log-neighbor-changes
  no bgp default route-target filter
  ! neighbor to another PE in core
  neighbor 205.3.0.3 remote-as 55
  neighbor 205.3.0.3 update-source Loopback0
  !
  address-family ipv4 mdt
  ! neighbor to another PE in core
  neighbor 205.3.0.3 activate
  neighbor 205.3.0.3 send-community extended
  exit-address-family
  !
  address-family vpnv6
  ! neighbor to another PE in core
  neighbor 205.3.0.3 activate
  neighbor 205.3.0.3 send-community extended
  exit-address-family
  !
  address-family vpnv6 multicast
  ! neighbor to another PE in core
  ! this address-family is added to enable
  ! safi129 between two PEs
  neighbor 205.3.0.3 activate
neighbor 205.3.0.3 send-community extended
exit-address-family

address-family ipv6 vrf blue

neighbor to CE1 in vrf
redistribute connected
redistribute static
neighbor FE80::20:1:6%Ethernet1/1 remote-as 56
neighbor FE80::20:1:6%Ethernet1/1 activate
exit-address-family

address-family ipv6 multicast vrf blue

neighbor to CE1 in vrf

this address-family is added to enable
safi2 on PE-CE
redistribute connected
redistribute static
neighbor FE80::20:1:6%Ethernet1/1 remote-as 56
neighbor FE80::20:1:6%Ethernet1/1 activate

exit-address-family

ipv6 pim vrf blue rp-address 201::1:1:7 blue_bidir_acl bidir
ipv6 pim vrf blue rp-address 202::1:1:6 blue_sparse_acl

ipv6 access-list black_bidir_acl
permit ipv6 any FF06::/64

ipv6 access-list black_sparse_acl
permit ipv6 any FF04::/64

ipv6 access-list blue_bidir_acl
permit ipv6 any FF05::/64

ipv6 access-list blue_sparse_acl
permit ipv6 any FF03::/64

end

The example below shows the configuration for a CE router:

hostname CE1

ip multicast-routing
ip cef
ipv6 unicast-routing
ipv6 multicast-routing
ipv6 multicast rpf use-bgp
ipv6 cef

interface Ethernet1/1
bandwidth 1000
ip address 10.1.0.6 255.255.255.0
no ip redirects
no ip proxy-arp
ip pim sparse-dense-mode
delay 100
ipv6 address FE80::20:1:6 link-local
ipv6 address 20::1:1:6/64
ipv6 enable
no keepalive

router bgp 56
bgp log-neighbor-changes
neighbor FE80::20:1:1%Ethernet1/1 remote-as 55

address-family ipv6
redistribute connected
redistribute static
neighbor FE80::20:1:1%Ethernet1/1 activate
exit-address-family

address-family ipv6 multicast
redistribute connected
redistribute static
neighbor FE80::20:1:1%Ethernet1/1 activate
exit-address-family
!
ipv6 pim rp-address 201::1:1:7 blue_bidir_acl bidir
ipv6 pim rp-address 202::1:1:6 blue_sparse_acl
!
ipv6 access-list blue_bidir_acl
   permit ipv6 any FF05::/64
!
ipv6 access-list blue_sparse_acl
   permit ipv6 any FF03::/64
!
end

Additional References

Related Documents

<table>
<thead>
<tr>
<th>Related Topic</th>
<th>Document Title</th>
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<tbody>
<tr>
<td>Cisco IOS commands</td>
<td>Cisco IOS Master Command List, All Releases</td>
</tr>
<tr>
<td>BGP commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples</td>
<td>Cisco IOS IP Routing: BGP Command Reference</td>
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Standards and RFCs

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<th>Standard/RFC</th>
<th>Title</th>
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<tr>
<td>MDT SAFI</td>
<td>Subsequent Address Family Identifiers (SAFI) Parameters</td>
</tr>
<tr>
<td>RFC 2547</td>
<td>BGP/MPLS VPNs</td>
</tr>
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Technical Assistance

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<tr>
<th>Description</th>
<th>Link</th>
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<tbody>
<tr>
<td>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.</td>
<td><a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a></td>
</tr>
</tbody>
</table>
Feature Information for BGP-MVPN SAFI 129 IPv6

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—MVPN SAFI 129 IPv6

<table>
<thead>
<tr>
<th>Feature Name</th>
<th>Releases</th>
<th>Feature Information</th>
</tr>
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<tbody>
<tr>
<td>BGP—MVPN SAFI 129 IPv6</td>
<td>15.2(4)S</td>
<td>SAFI 129, known as VPN Multicast SAFI, provides the capability to support multicast routing in the service provider's core IPv6 network.</td>
</tr>
<tr>
<td></td>
<td>Cisco IOS XE Release 3.7S</td>
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<tr>
<td></td>
<td>15.3(1)T</td>
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<tr>
<td></td>
<td></td>
<td>The following commands were introduced or modified: address-family ipv6, address-family vpnv6, and show bgp vpnv6 multicast.</td>
</tr>
</tbody>
</table>