Multitopology Routing Configuration Guide, Cisco IOS Release 15M&T

First Published: February 27, 2007

CONTENTS

Multitopology BGP With VRF Enhancement

The Multitopology Border Gateway Protocol (BGP) with virtual routing and forwarding (VRF) enhancement enables independent configuration of multicast sub address-family and unicast address-family within a VRF definition. This document describes how to configure BGP for Multitopology Routing (MTR) with VRF enhancement.

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.

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.

Information About Multitopology BGP With VRF Enhancement

Multitopology BGP with VRF Enhancement

The Multitopology Border Gateway Protocol (BGP) with virtual routing and forwarding (VRF) enhancement enables independent configuration of multicast subaddress-family and unicast address-family within a VRF definition.

The subsequent address-family identifiers (SAFI 129) feature supports configuration of a multicast VPN topology that differs from a unicast VPN topology. This difference in topologies is achieved by injecting a different subset of routes for multicast as compared to unicast. However, that is not the case with VRF definitions. The same configuration is used for both unicast and multicast topologies to attain their VRF-level attributes. Therefore, to achieve different topologies for multicast and unicast for VRF definitions, the multitopology BGP with VRF enhancement feature uses the multicast VRF subaddress-family attribute.

Note The multicast VRF subaddress-family attribute can only be configured for the multitopology BGP with VRF enhancement feature, that is, you cannot configure the **address-family ipv4 multicast** command under a specific VRF definition until you configure the multitopology BGP with VRF enhancement feature for that VRF definition. When you configure this feature, all operations related to BGP VPN and BGP VRF routing, refer to the configuration done using the **address-family ipv4 multicast** command.

How to Configure Multitopology BGP With VRF Enhancement

Configuring Multitopology BGP with VRF Enhancement

SUMMARY STEPS

1. **enable**
   - Enter your password if prompted.

2. **configure terminal**
3. **ip multicast-routing** [**vrf** *name*]
4. **ip multicast rpf multitopology**
5. **vrf definition** *vrf-name*
6. **rd** {*ASN:nn* | *IP-addr:nn*}
7. **address-family** {**ipv4** | **ipv6**} [**multicast** | **unicast**]
8. **route-target** {**both** | **import** | **export**} {*ASN:nn* | *IP-addr:nn*}
9. **exit-address-family**
10. **ipv4 multicast topology**
11. **address-family** {**ipv4** | **ipv6**} [**multicast** | **unicast**]
12. **topology** {**base** | *topology-name*}
13. **route-target** {**both** | **import** | **export**} {*ASN:nn* | *IP-addr:nn*}
14. **exit-address-family**
15. **exit-address-family**
16. **end**

DETAILED STEPS

	Command or Action	**Purpose**
Step 1	**enable** • Enter your password if prompted. **Example:** `Device> enable`	Enables privileged EXEC mode.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ip multicast-routing** [**vrf** *name*] **Example:** `Device(config)# ip multicast-routing`	Enables IP multicast routing.
Step 4	**ip multicast rpf multitopology** **Example:** `Device(config)# ip multicast rpf multitopology`	Enables Multitopology Routing (MTR) support for IP multicast routing.
Step 5	**vrf definition** *vrf-name* **Example:** `Device(config)# vrf definition v1`	Configures a VRF definition and enables VRF configuration mode.
Step 6	**rd** {*ASN:nn* | *IP-addr:nn*} **Example:** `Device(config-vrf)# rd 2:2`	Specifies the VPN route distinguisher for a VRF instance.
Step 7	**address-family** {**ipv4** | **ipv6**} [**multicast** | **unicast**] **Example:** `Device(config-vrf)# address-family ipv4 multicast`	Configures address modifiers and enables IPv4/IPv6 VRF address-family configuration submode.
Step 8	**route-target** {**both** | **import** | **export**} {*ASN:nn* | *IP-addr:nn*} **Example:** `Device(config-vrf-af)# route-target import 8:8`	Configures target VPN community for a VRF instance.

	Command or Action	**Purpose**
Step 9	**exit-address-family** **Example:** `Device(config-vrf-af)# exit-address-family`	Exits IPv4/IPv6 VRF address-family configuration submode and returns to VRF configuration mode.
Step 10	**ipv4 multicast topology** **Example:** `Device(config-vrf)# ipv4 multicast multitopology`	Enables MTR support for IPv4 multicast routing.
Step 11	**address-family** {**ipv4** │ **ipv6**} [**multicast** │ **unicast**] **Example:** `Device(config-vrf)# address-family ipv4 multicast`	Configures address modifiers and enables IPv4/IPv6 VRF address-family configuration submode.
Step 12	**topology** {**base** │ *topology-name*} **Example:** `Device(config-vrf-af)# topology base`	Configures the topology instance in which BGP routes class-specific or base topology traffic and enables IPv4/IPv6 multitopology VRF address-family configuration submode.
Step 13	**route-target** {**both** │ **import** │ **export**} {*ASN:nn* │ *IP-addr:nn*} **Example:** `Device(config-vrf-af-topology)# route-target import 8:8`	Configures target VPN community for a VRF instance.
Step 14	**exit-address-family** **Example:** `Device(config-vrf-af-topology)# exit-topology`	Exits IPv4/IPv6 multitopology VRF address-family configuration submode and returns to IPv4/IPv6 VRF address-family configuration submode.
Step 15	**exit-address-family** **Example:** `Device(config-vrf-af)# exit-address-family`	Exits IPv4/IPv6 VRF address-family configuration submode and returns to VRF configuration mode.
Step 16	**end** **Example:** `Device(config-vrf)# end`	Returns to privileged EXEC mode.

Configuration Examples for Multitopology BGP With VRF Enhancement

Example: Configuring Multitopology BGP with VRF Enhancement

The following configuration shows how to configure the multitopology BGP with VRF enhancement feature:

```
Device> enable
Device# configure terminal
Device(config)# ip multicast-routing
Device(config)# ip multicast vrf v1 rpf multitopology
Device(config)# vrf definition v1
Device(config-vrf)# rd 2:2
Device(config-vrf)# address-family ipv4
Device(config-vrf-af)# route-target import 4:4
Device(config-vrf-af)# exit-address-family
Device(config-vrf)# ipv4 multicast multitopology
Device(config-vrf)# address-family ipv4 multicast
Device(config-vrf-af)# topology base
Device(config-vrf-af-topology)# route-target import 8:8
Device(config-vrf-af-topology)# exit-topology
Device(config-vrf-af)# exit-address-family
Device(config-vrf)# end
```

Note The configuration of two address-families for the VRF definition "v1" is different in such a way that multitopology enables the **address-family ipv4 multicast** command to configure multicast VRF routing, which, in turn, imports routes with route-target 8:8 but does not import routes with route-target 4:4. It means that if the multitopology feature is configured, the configuration defined in **address-family ipv4 multicast** command under a VRF definition is applicable for multicast VRF routing. When the multitopology feature is not configured, the routing is based on the configuration defined in **address-family ipv4** command under a VRF definition.

Additional References For Multitopology BGP With VRF Enhancement

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
Multitopology Routing (MTR) commands	Cisco IOS Multitopology Routing Command Reference
Border Gateway Protocol (BGP) commands	Cisco IOS IP Routing: BGP Command Reference

Related Topic	Document Title
BGP concepts and tasks	*IP Routing: BGP Configuration Guide*
BGP Support for MTR	*Multitopology Routing Configuration Guide*

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 Multitopology BGP With VRF Enhancement

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 . An account on Cisco.com is not required.

Table 1: Feature Information for Multitopology BGP With VRF Enhancement

Feature Name	Releases	Feature Information
Multitopology BGP With VRF Enhancement		The Multitopology BGP with VRF enhancement enables independent configuration of multicast address-family and unicast address-family within a VRF definition. The following command was modified to be configured only when multitopology is configured under VRF: **address-family ipv4 multicast**

Multicast MTR in VRF

The Multicast MTR in VRF feature provides Multitopology Routing (MTR) support for multicast and allows you to control the path of multicast traffic in the network.

The Multicast MTR in VRF feature extends to IPv4 and VRF contexts the Cisco IOS software's capability that allows users to configure one or more non-congruent multicast topologies in global IPv4 routing context. These contexts can be used to forward unicast and multicast traffic over different links in the network, or in the case of non-base topologies to provide a Live-Live multicast service using multiple non-congruent multicast topologies mapped to different (S,G) groups.

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.

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 Multicast MTR in VRF

- VRF must be configured.

Information About Multicast MTR in VRF

Overview of Multicast MTR in VRF

Cisco software supports legacy pre-Multitopology Routing (MTR) IP multicast behavior by default. MTR support for IP multicast must be explicitly enabled. Legacy IP multicast uses reverse path forwarding (RPF) on routes in the unicast Routing Information Base (RIB) to build multicast distribution trees (MDTs).

MTR introduces a multicast topology that is completely independent from the unicast topology. MTR integration with multicast allows you to control the path of multicast traffic in the network.

The multicast topology maintains separate routing and forwarding tables. The following list summarizes MTR multicast support that is integrated into Cisco software:

- Conventional longest match support for multicast routes.

- RPF support for Protocol Independent Multicast (PIM).

- Border Gateway Protocol (BGP) MDT sub address family identifier (SAFI) support for Inter-AS VPNs (SAFI number 66).

- Support for static multicast routes integrated into the **ip route topology** command (modifying the **ip mroute** command).

As in pre-MTR software, enable multicast support by configuring the **ip multicast-routing** command in global configuration mode. You enable MTR support for multicast by configuring the **ip multicast rpf multitopology** command. After the device enters global address family configuration mode, you then enter the **topology** command with the **base** keyword; global topology configuration parameters are applied in this mode.

For details on multitopology routing, see "Multitopology Routing" module. For details on MTR in VRF feature, see "MTR in VRF" module.

How to Configure Multicast MTR in VRF

Configuring a Multicast MTR in VRF

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast vrf** *vrf-name* **topology** {**unicast** | **multicast**} *topology-name* **tid** *topology-number*
4. **ip multicast vrf** *vrf-name* **rpf select topology** {**unicast** | **multicast**} *topology-name* **ip acl extended**
5. **ip route vrf** *vrf-name* **topology** *topology-name destination-address destination-mask* {*forwarding-address* | **interface** [*forwarding-address*]} [**multicast**]
6. **exit**

DETAILED STEPS

	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 multicast vrf** *vrf-name* **topology** {**unicast**	**multicast**} *topology-name* **tid** *topology-number* **Example:** `Device(config)# ip multicast vrf kmdvrf topology multicast kmdtopo tid 111`	Configures VRF and topology selection for IP multicast streams.
Step 4	**ip multicast vrf** *vrf-name* **rpf select topology** {**unicast**	**multicast**} *topology-name* **ip acl extended** **Example:** `Device(config)# ip multicast vrf kmdvrf rpf select topology multicast kmdtopo ip acl extended`	Associates a multicast topology with a multicast group that has a specific multicast route entry.
Step 5	**ip route vrf** *vrf-name* **topology** *topology-name* *destination-address destination-mask* {*forwarding-address*	**interface** [*forwarding-address*]} [**multicast**] **Example:** `Device(config)# ip route vrf kmdvrf topology kmdtopo 10.0.0.0 255.0.0.0 Ethernet 0/0 multicast`	Configures static routing under a topology instance. • VRF and topology can be specified together only when the multicast is specified.
Step 6	**exit** **Example:** `Device(config)# exit`	Exits global configuration mode.

Configuration Examples for Multicast MTR in VRF

Example: Multicast MTR in VRF

```
!
 ip multicast vrf kmdvrf topology multicast kmdtopo tid 111
 ip multicast vrf kmdvrf rpf select topology multicast kmdtopo ip acl extended
 ip route vrf kmdvrf topology kmdtopo 10.0.0.0 255.0.0.0 Ethernet 0/0 multicast
!
```

Additional References for Multicast MTR in VRF

Related Documents

Related Topic	Document Title
Cisco IOS commands	Cisco IOS Master Command List, All Releases
Multitopology Routing (MTR) commands	Cisco IOS Multitopology Routing Command Reference
IP Multicast commands	Cisco IOS Multicast Command Reference
Multitopology Routing MTR Support for Multicast MTR in VRF	Multitopology Routing Configuration Guide

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/support

Feature Information for Multicast MTR in VRF

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 . An account on Cisco.com is not required.

Table 2: Feature Information for Multicast MTR in VRF

Feature Name	Releases	Feature Information
Multicast MTR in VRF	15.4(2)T	The Multicast MTR in VRF feature extends to IPv4 and VRF contexts the Cisco IOS software's capability that allows users to configure one or more non-congruent multicast topologies in global IPv4 routing context.
		The following commands were introduced or modified: **ip mulitcast vrf** *vrf-name* **topology {unicast | multicast}** *topology-name* **tid** *topology number*, **ip mulitcast vrf** *vrf-name* **rpf select topology {unicast | multicast}** *topology-name* **ip acl extended** , **ip route vrf** *vrf-name* **topology** *topology-name destination-address destination-mask* **{***forwarding-address* | **interface** [*forwarding-address*]**} [multicast]**