



Multitopology Routing Configuration Guide, Cisco IOS Release 15SY

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CHAPTER

1

MTR Support for Multicast

The MTR Support for Multicast feature provides Multitopology Routing (MTR) support for multicast and allows you to control the path of multicast traffic in the network. This module describes how to configure MTR support for multicast.

- [Finding Feature Information, page 1](#)
- [Restrictions for MTR Support for Multicast, page 1](#)
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- [How to Configure MTR Support for Multicast, page 3](#)
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- [Additional References, page 7](#)
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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.

Restrictions for MTR Support for Multicast

Only a single multicast topology can be configured, and only the **topology base** command can be entered when the multicast topology is created.

Information About MTR Support for Multicast

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 subaddress 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, you 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.

How to Configure MTR Support for Multicast

Configuring a Multicast Topology for MTR

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast-routing** [*vrf name*]
4. **ip multicast rpf mult topology**
5. **global-address-family ipv4** [**multicast** | **unicast**]
6. **topology** {**base** | *topology-name*}
7. **route-replicate from** {**multicast** | **unicast**} [**topology** {**base** | *name*}] *protocol* [**route-map** *name* | **vrf** *name*]
8. **use-topology unicast** {**base** | *topology-name*}
9. **shutdown**
10. **end**
11. **show topology** [**cache** [*topology-id*] | **ha** [**detail** | **interface** | **lock** | **router**] [**all** | **ipv4** | **ipv6** | **vrf** *vpn-instance*]]

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-routing [<i>vrf name</i>] Example: Device(config)# ip multicast-routing | Enables IP multicast routing. |

| | Command or Action | Purpose |
|--------|--|--|
| Step 4 | ip multicast rpf multitopology Example: <pre>Device(config)# ip multicast rpf multitopology</pre> | Enables Multitopology Routing (MTR) support for IP multicast routing. |
| Step 5 | global-address-family ipv4 [multicast unicast] Example: <pre>Device(config)# global-address-family ipv4 multicast</pre> | Enters global address family configuration mode to configure the global topology. <ul style="list-style-type: none"> The address family for the class-specific topology is specified in this step. The subaddress family can be specified. Unicast is the default if no subaddress family is entered. |
| Step 6 | topology {base topology-name} Example: <pre>Device(config-af)# topology base</pre> | Configures the global topology instance and enters address family topology configuration mode. <ul style="list-style-type: none"> Only the base keyword can be accepted for a multicast topology. |
| Step 7 | route-replicate from {multicast unicast} [topology {base name}] protocol [route-map name vrf name] Example: <pre>Device(config-af-topology)# route-replicate from unicast topology VOICE ospf route-map map1</pre> | (Optional) Replicates (copies) routes from another multicast topology Routing Information Base (RIB). <ul style="list-style-type: none"> The <i>protocol</i> argument is configured to specify the protocol that is the source of the route. Routes can be replicated from the unicast base topology or a class-specific topology. <p>Note However, route replication cannot be configured from a class-specific topology that is configured to forward the base topology (incremental forwarding). You can replicate routes from a multicast RIB to a multicast RIB or replicate routes from a unicast RIB to a multicast RIB, but you cannot replicate routes from a multicast RIB to a unicast RIB.</p> <ul style="list-style-type: none"> Replicated routes can be filtered through a route map before they are installed into the multicast RIB. |
| Step 8 | use-topology unicast {base topology-name} Example: <pre>Device(config-af-topology)# use-topology unicast VIDEO</pre> | (Optional) Configures a multicast topology to perform reverse path forwarding (RPF) computations using a unicast topology RIB. <ul style="list-style-type: none"> The base or a class-specific unicast topology can be configured. When this command is configured, the multicast topology uses routes in the specified unicast topology table to build multicast distribution trees. <p>Note This multicast RIB is not used when this command is enabled, even if the multicast RIB is populated and supported by a routing protocol.</p> |

| | Command or Action | Purpose |
|---------|--|---|
| Step 9 | shutdown Example: Device(config-af-topology)# shutdown | (Optional) Temporarily disables a topology instance without removing the topology configuration (while other topology parameters are configured and other devices are configured with MTR). |
| Step 10 | end Example: Device(config-af-topology)# end | (Optional) Exits address family topology configuration mode and enters privileged EXEC mode. |
| Step 11 | show topology [cache [topology-id] ha [detail interface lock router] [all ipv4 ipv6 vrf vpn-instance]] Example: Device# show topology detail | (Optional) Displays information about class-specific and base topologies. |

What to Do Next

The topology is not activated until classification is configured. See the “QoS-MQC Support for MTR” feature module to configure classification for a class-specific topology.

Configuration Examples for MTR Support for Multicast

Examples: Route Replication Configuration

The following example shows how to enable multicast support for Multitopology Routing (MTR) and to configure a separate multicast topology:

```
ip multicast-routing
ip multicast rpf multitopology
!
global-address-family ipv4 multicast
  topology base
end
```

The following example shows how to configure the multicast topology to replicate Open Shortest Path First (OSPF) routes from the VOICE topology. The routes are filtered through the VOICE route map before they are installed in the multicast routing table.

```
ip multicast-routing
ip multicast rpf multitopology
!
access-list 1 permit 192.168.1.0 0.0.0.255
!
```

```

route-map VOICE
  match ip address 1
  exit
!
global-address-family ipv4 multicast
  topology base
  route-replicate from unicast topology VOICE ospf route-map VOICE

```

Example: Using a Unicast RIB for Multicast RPF Configuration

The following example shows how to configure the multicast topology to perform reverse path forwarding (RPF) calculations on routes in the VIDEO topology Routing Information Base (RIB) to build multicast distribution trees:

```

ip multicast-routing
ip multicast rpf multitopology
!
global-address-family ipv4 multicast
  topology base
  use-topology unicast VIDEO
end

```

Example: Multicast Verification

The following example shows that the multicast topology is configured to replicate routes from the Routing Information Base (RIB) of the VOICE topology:

```

Device# show topology detail

Topology: base
  Address-family: ipv4
  Associated VPN VRF is default
  Topology state is UP
  Associated interfaces:
    Ethernet0/0, operation state: UP
    Ethernet0/1, operation state: DOWN
    Ethernet0/2, operation state: DOWN
    Ethernet0/3, operation state: DOWN
    Loopback0, operation state: UP

Topology: VIDEO
  Address-family: ipv4
  Associated VPN VRF is default
  Topology state is UP
  Topology fallback is enabled
  Topology maximum route limit 1000, warning limit 90% (900)
  Associated interfaces:

Topology: VOICE
  Address-family: ipv4
  Associated VPN VRF is default
  Topology state is UP
  Topology is enabled on all interfaces
  Associated interfaces:
    Ethernet0/0, operation state: UP
    Ethernet0/1, operation state: DOWN
    Ethernet0/2, operation state: DOWN
    Ethernet0/3, operation state: DOWN
    Loopback0, operation state: UP

Topology: base
  Address-family: ipv4 multicast
  Associated VPN VRF is default
  Topology state is DOWN
  Multicast multi-topology mode is enabled.
  Route Replication Enabled:

```

```

from unicast topology VOICE all route-map VOICE
Associated interfaces:

```

Additional References

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 |
| IP multicast concepts and tasks | <i>IP Multicast Configuration Guide Library</i> |

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 MTR Support for Multicast

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.

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Table 1: Feature Information for MTR Support for Multicast

| Feature Name | Releases | Feature Information |
|---------------------------|---|--|
| MTR Support for Multicast | 12.2(33)SRB 15.0(1)M 15.0(1)SY 15.1(1)SY | <p>This feature provides Multitopology Routing (MTR) support for multicast and allows you to control the path of multicast traffic in the network.</p> <p>The following commands were introduced or modified: clear ip route multicast, ip multicast rpf multitopology, show ip route multicast, use-topology.</p> |



IS-IS MTR for Multicast Address Family

The IS-IS MTR for Multicast Address Family feature enables Intermediate System to Intermediate System (IS-IS) protocol to support Multitopology Routing (MTR) in the following ways:

- Advertise topology-specific routes to protocol peers
- Perform best path calculation on multiple topologies
- Update routes for each of the supported topologies in the global Routing Information Base (RIB)
- Support configuration commands related to MTR
- Support multiple multicast topologies
- [Finding Feature Information, page 9](#)
- [Information About IS-IS MTR for Multicast Address Family, page 10](#)
- [How to Configure IS-IS MTR for Multicast Address Family, page 11](#)
- [Verifying IS-IS MTR for Multicast Address Family, page 14](#)
- [Configuration Examples for IS-IS MTR for Multicast Address Family, page 15](#)
- [Additional References for IS-IS MTR for Multicast Address Family, page 15](#)
- [Feature Information for IS-IS MTR for Multicast Address Family, page 16](#)

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.

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Information About IS-IS MTR for Multicast Address Family

IS-IS MTR for Multicast Address Family Overview

The IS-IS MTR for Multicast Address Family feature supports multiple IPv4 multicast topologies, which are incongruent from unicast topologies in the global address space.

Routing Protocol Support for MTR

You must enable IP routing on the device for Multitopology Routing (MTR) to operate. MTR supports static and dynamic routing in Cisco software. You can enable dynamic routing per topology to support interdomain and intradomain routing. Route calculation and forwarding are independent for each topology. MTR support is integrated into Cisco software for the following protocols:

- Enhanced Interior Gateway Routing Protocol (EIGRP)
- Integrated Intermediate System-to-Intermediate System (IS-IS)

You must apply the per-topology configuration in router address family configuration mode of the global routing process (router configuration mode). The address family and the subaddress family are specified when the device enters address family configuration mode. You can specify the topology name and topology ID by entering the **topology** command in address family configuration mode. You can configure each topology with a unique topology ID under the routing protocol. The topology ID is used to identify and group Network Layer Reachability Information (NLRI) for each topology in updates for a given protocol. In EIGRP and IS-IS, you enter the topology ID during the first configuration of the **topology** command for a class-specific topology.

You can configure class-specific topologies with metrics that are different than the base topology. Interface metrics configured on the base topology can be inherited by the class-specific topology. Inheritance occurs if no explicit inheritance metric is configured in the class-specific topology. By default, interfaces are not included in nonbase topologies. For routing protocol support for EIGRP and IS-IS, you must explicitly configure a nonbase topology on an interface. You can override the default behavior by using the **all-interfaces** command in address family topology configuration mode. The **all-interfaces** command causes the nonbase topology to be configured on all interfaces of the device that are part of the default address space in which the topology is configured.

How to Configure IS-IS MTR for Multicast Address Family

Configuring a Multicast Topology

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip multicast-routing**
4. **ip multicast rpf multitopology**
5. **global-address-family ipv4 multicast**
6. **topology {base | topology-name}**
7. Repeat Step 6 to configure another global topology instance.
8. **exit**
9. **interface type number**
10. **ip address ip-address mask [secondary]**
11. **ip pim sparse-dense-mode**
12. **ip router isis**
13. **topology ipv4 multicast {topology-name [disable] | base}**
14. **exit**
15. Repeat Steps 9 through 14 to configure each interface in use.
16. **end**

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-routing Example: Device(config)# ip multicast-routing | Enables IP multicast routing. |

| | Command or Action | Purpose |
|---------|---|---|
| Step 4 | ip multicast rpf mult topology Example: Device(config)# ip multicast rpf mult topology | Enables multicast Reverse Path Forwarding (RPF) lookup in multiple topologies. |
| Step 5 | global-address-family ipv4 multicast Example: Device(config)# global-address-family ipv4 multicast | Enters global address family configuration mode to configure a topology. |
| Step 6 | topology {base topology-name} Example: Device(config-af)# topology live | Configures a global topology instance. |
| Step 7 | Repeat Step 6 to configure another global topology instance. | — |
| Step 8 | exit Example: Device(config-af)# exit | Exits global address family configuration mode and returns to global configuration mode. |
| Step 9 | interface type number Example: Device(config)# interface GigabitEthernet 1/0 | Enters interface configuration mode for the specified interface type and number. |
| Step 10 | ip address ip-address mask [secondary] Example: Device(config-if)# ip address 209.165.200.225 255.255.255.224 | Sets a primary or secondary IP address for an interface. |
| Step 11 | ip pim sparse-dense-mode Example: Device(config-if)# ip pim sparse-dense-mode | Enables PIM sparse dense mode on the interface. |
| Step 12 | ip router isis Example: Device(config-if)# ip router isis | Configures an Intermediate System-to-Intermediate System (IS-IS) routing process for IP on the interface. |
| Step 13 | topology ipv4 multicast {topology-name [disable] base} Example: Device(config-if)# topology ipv4 multicast live | Configures a topology instance on an interface. |
| Step 14 | exit Example: Device(config-if)# exit | Exits interface configuration mode and returns to global configuration mode. |

| | Command or Action | Purpose |
|----------------|---|---|
| Step 15 | Repeat Steps 9 through 14 to configure each interface in use. | — |
| Step 16 | end Example: Device(config)# end | Ends the current configuration session and returns to privileged EXEC mode. |

Activating an MTR Topology by using IS-IS

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis**
4. **net *net1***
5. **metric-style wide [transition] [level-1 | level-2 | level-1-2]**
6. **address-family ipv4 multicast**
7. **topology *topology-name* tid number**
8. **end**

DETAILED STEPS

| | Command or Action | Purpose |
|---------------|---|--|
| Step 1 | enable Example: Device> enable | Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted. |
| Step 2 | configure terminal Example: Device# configure terminal | Enters global configuration mode. |
| Step 3 | router isis Example: Device(config)# router isis | Enables the IS-IS routing protocol and specifies an IS-IS process. |
| Step 4 | net <i>net1</i> Example: Device(config-router)# net 31.3131.3131.3131.00 | Configures an IS-IS network entity (NET) for the routing process. |

| | Command or Action | Purpose |
|---------------|--|--|
| Step 5 | metric-style wide [<i>transition</i>] [<i>level-1</i> <i>level-2</i> <i>level-1-2</i>] Example: Device(config-router)# metric-style wide | Configures a router running IS-IS so that it generates and accepts only new-style type-length-value (TLV) objects. |
| Step 6 | address-family ipv4 multicast Example: Device(config-router)# address-family ipv4 multicast | Enters router address family configuration mode under IS-IS router configuration mode. |
| Step 7 | topology topology-name tid number Example: Device(config-router-af)# topology live tid 10 | Enters router address family configuration mode under IS-IS router configuration mode. |
| Step 8 | end Example: Device(config-router-af)# end | Exits router address family configuration mode and returns to privileged EXEC mode. |

Verifying IS-IS MTR for Multicast Address Family

SUMMARY STEPS

1. enable
2. show ip multicast topology [*multicast topology-name*]

DETAILED STEPS

| | Command or Action | Purpose |
|---------------|--|--|
| Step 1 | enable Example: Device> enable | Enables privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted. |
| Step 2 | show ip multicast topology [<i>multicast topology-name</i>] Example: Device# show ip multicast topology multicast live | Displays multicast topology information. |

Configuration Examples for IS-IS MTR for Multicast Address Family

Example: Multicast Topology Configuration

The following example shows how to configure IS-IS MTR for Multicast Address Family:

```
Device> enable
Device# configure terminal
Device(config)# ip multicast-routing
Device(config)# ip multicast rpf multitopology
Device(config)# global-address-family ipv4 multicast
Device(config-af)# topology live
Device(config-af-topology)# exit
Device(config-af)# exit
Device(config)# interface GigabitEthernet 1/0
Device(config-if)# ip address 10.1.1.1 255.255.255.0
Device(config-if)# ip pim sparse-dense-mode
Device(config-if)# ip router isis
Device(config-if)# topology ipv4 multicast live
```

Example: Activating an MTR Topology by using IS-IS

The following example shows how to activate an MTR topology by using IS-IS:

```
Device> enable
Device# configure terminal
Device(config)# router isis
Device(config-router)# net 31.3131.3131.3131.00
Device(config-router)# metric-style wide
Device(config-router)# address-family ipv4 multicast
Device(config-router-af)# topology live tid 10
```

Additional References for IS-IS MTR for Multicast Address Family

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 |
| Intermediate System-to-Intermediate System (IS-IS) commands | Cisco IOS IP Routing: IS-IS Command Reference |

| Related Topic | Document Title |
|----------------------------------|---|
| IS-IS concepts and tasks | IP Routing: IS-IS Configuration Guide |
| Configuring a multicast topology | Multitopology Routing Configuration Guide |

Standards and RFCs

| Standard/RFC | Title |
|--------------|---|
| RFC 5120 | <i>M-ISIS: Multitopology (MT) Routing in Intermediate System-to-Intermediate Systems (IS-ISs)</i> |

Technical Assistance

| Description | Link |
|---|---|
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Feature Information for IS-IS MTR for Multicast Address Family

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Table 2: Feature Information for IS-IS MTR for Multicast Address Family

| Feature Name | Releases | Feature Information |
|--|-----------------|--|
| IS-IS MTR for Multicast Address Family | 15.1(2)SY | The IS-IS MTR for Multicast Address Family feature supports single and multiple IPv4 multicast topologies which are incongruent from unicast topologies in the global address space. |

