IS-IS Support for MTR

The IS-IS Support for MTR feature provides Intermediate System-to-Intermediate System (IS-IS) support for multiple logical topologies over a single physical network. This module describes how to configure IS-IS for Multitopology Routing (MTR) for both unicast and multicast topologies.

Prerequisites for IS-IS Support for MTR

- Be familiar with the concepts in the "Routing Protocol Support for MTR" section.

- Configure and activate a global topology configuration.

- You must configure a multicast topology before activating the Intermediate System-to-Intermediate System (IS-IS) protocol in the multicast topology. For details, see the "MTR support for Multicast" feature module.

- Activate a Multitopology Routing (MTR) topology on an IS-IS device.

- Configure the MTR topology to globally configure all interfaces by using the **all-interfaces** address family topology configuration command, or configure the IS-IS topology in interface configuration mode to configure only IS-IS interfaces. The order in which you perform the two tasks does not matter.

Restrictions for IS-IS Support for MTR

Only the IPv4 address family (multicast and unicast) and IPv6 address family unicast are supported. For information about configuring Multitopology IS-IS for IPv6, see the *IS-IS Configuration Guide.*

../topics/Information About IS-IS Support for MTR

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:

• Border Gateway Protocol (BGP)

• Integrated Intermediate System-to-Intermediate System (IS-IS)

You apply the per-topology configuration in router address family configuration mode of the global routing process (router configuration mode). The address family and subaddress family are specified when the device enters address family configuration mode. You specify the topology name and topology ID by entering the **topology** command in address family configuration mode.

You 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 OSPF, EIGRP, and IS-IS, you enter the topology ID during the first configuration of the **topology** command for a class-specific topology. In BGP, you configure the topology ID by entering the **bgp tid** command under the topology configuration.

You can configure class-specific topologies with different metrics 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.

You configure BGP support only in router configuration mode. You configure Interior Gateway Protocol (IGP) support in router configuration mode and in interface configuration mode.

By default, interfaces are not included in nonbase topologies. For routing protocol support for EIGRP, IS-IS, and OSPF, 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 or the virtual routing and forwarding (VRF) instance in which the topology is configured.

Interface Configuration Support for MTR

The configuration of a Multitopology Routing (MTR) topology in interface configuration mode allows you to enable or disable MTR on a per-interface basis. By default, a class-specific topology does not include any interfaces.

You can include or exclude individual interfaces by configuring the **topology** interface configuration command. You specify the address family and the topology (base or class-specific) when entering this command. The subaddress family can be specified. If no subaddress family is specified, the unicast subaddress family is used by default.

You can include globally all interfaces on a device in a topology by entering the **all-interfaces** command in routing topology configuration mode. Per-interface topology configuration applied with the **topology** command overrides global interface configuration.

The interface configuration support for MTR has these characteristics:

- Per-interface routing configuration: Interior Gateway Protocol (IGP) routing and metric configurations can be applied in interface topology configuration mode. Per-interface metrics and routing behaviors can be configured for each IGP.

- Open Shortest Path First (OSPF) interface topology configuration: Interface mode OSPF configurations for a class-specific topology are applied in interface topology configuration mode. In this mode, you can configure an interface cost or disable OSPF routing without removing the interface from the global topology configuration.

- Enhanced Interior Gateway Routing Protocol (EIGRP) interface topology configuration: Interface mode EIGRP configurations for a class-specific topology are applied in interface topology configuration mode. In this mode, you can configure various EIGRP features.

- Intermediate System-to-Intermediate System (IS-IS) interface topology configuration: Interface mode IS-IS configurations for a class-specific topology are applied in interface topology configuration mode. In this mode, you can configure an interface cost or disable IS-IS routing without removing the interface from the global topology configuration.

../topics/How to Configure IS-IS Support for MTR

Activating an MTR Topology by Using IS-IS

Note Only Multitopology Routing (MTR) commands are shown in this task.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router isis** [*area-tag*]
4. **net** *network-entity-title*
5. **metric-style wide** [**transition**] [**level-1** | **level-2** | **level-1-2**]
6. **address-family ipv4** [**multicast** | **unicast**]
7. **topology** *topology-name* **tid** *number*
8. **end**
9. **show isis neighbors detail**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Device> enable	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router isis** [*area-tag*] **Example:** `Device(config)# router isis`	Enables the Intermediate System-to-Intermediate System (IS-IS) routing protocol and optionally specifies an IS-IS process. • Enters router configuration mode.
Step 4	**net** *network-entity-title* **Example:** `Device(config-router)# net 31.3131.3131.3131.00`	Configures an IS-IS network entity title (NET) for a Connectionless Network Service (CLNS) routing process.
Step 5	**metric-style wide** [**transition**] [**level-1** | **level-2** | **level-1-2**] **Example:** `Device(config-router)# metric-style wide`	Globally changes the metric value for all IS-IS interfaces. **Note** Wide style metrics are required for prefix tagging.
Step 6	**address-family ipv4** [**multicast** | **unicast**] **Example:** `Device(config-router)# address-family ipv4`	Enters router address family configuration mode.
Step 7	**topology** *topology-name* **tid** *number* **Example:** `Device(config-router-af)# topology DATA tid 100`	Configures IS-IS support for the topology and assigns a Topology Identifier (TID) number for each topology. • In this example, IS-IS support for the DATA topology is configured.
Step 8	**end** **Example:** `Device(config-router-af)# end`	Exits router address family configuration mode and returns to privileged EXEC mode.
Step 9	**show isis neighbors detail** **Example:** `Device# show isis neighbors detail`	(Optional) Displays information about IS-IS neighbors, including MTR information for the TID values for the device and its IS-IS neighbors.

What to Do Next

If a Border Gateway Protocol (BGP) topology configuration is required, see the "BGP Support for MTR" feature module.

Activating an MTR Topology in Interface Configuration Mode by Using IS-IS

Before you begin

Define a topology globally before performing the per-interface topology configuration.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *type number*
4. **ip address** *ip-address mask* [**secondary**]
5. **ip router isis** [*area-tag*]
6. **topology ipv4** [**multicast** | **unicast**] {*topology-name* [**disable** | **base**]}
7. **isis topology disable**
8. **topology ipv4** [**multicast** | **unicast**] {*topology-name* [**disable** | **base**]}
9. **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	**interface** *type number* **Example:** Device(config)# interface Ethernet 2/0	Specifies the interface type and number, and enters interface configuration mode.
Step 4	**ip address** *ip-address mask* [**secondary**] **Example:** Device(config-if)# ip address 192.168.7.17 255.255.255.0	Sets a primary or secondary IP address for an interface.
Step 5	**ip router isis** [*area-tag*] **Example:** Device(config-if)# ip router isis	Configures an Intermediate System-to-Intermediate System (IS-IS) routing process for IP on an interface and attaches an area designator to the routing process. **Note** If a tag is not specified, a null tag is assumed and the process is referenced with a null tag.

	Command or Action	Purpose
Step 6	**topology ipv4** [**multicast**	**unicast**] {*topology-name* [**disable**	**base**]} **Example:** `Device(config-if)# topology ipv4 DATA`	Configures a Multitopology Routing (MTR) topology instance on an interface and enters interface topology configuration mode. **Note** In this example, the topology instance DATA is configured for an MTR network that has a global topology named DATA.
Step 7	**isis topology disable** **Example:** `Device(config-if-topology)# isis topology disable`	(Optional) Prevents an IS-IS process from advertising the interface as part of the topology. **Note** In this example, the topology instance DATA will not advertise the interface as part of the topology.
Step 8	**topology ipv4** [**multicast**	**unicast**] {*topology-name* [**disable**	**base**]} **Example:** `Device(config-if-topology)# topology ipv4 VOICE`	Configures an MTR topology instance on an interface. **Note** In this example, the topology instance VOICE is configured for an MTR network that has a global topology named VOICE.
Step 9	**end** **Example:** `Device(config-if-topology)# end`	Exits interface topology configuration mode and returns to privileged EXEC mode.

Monitoring Interface and Topology IP Traffic Statistics for MTR

Use any of the following commands in any order to monitor interface and topology IP traffic statistics for Multitopology Routing (MTR).

SUMMARY STEPS

1. **enable**
2. **show ip interface** [*type number*] [**topology** {*name* | **all** | **base**}] [**stats**]
3. **show ip traffic** [**topology** {*name* | **all** | **base**}]
4. **clear ip interface** *type number* [**topology** {*name* | **all** | **base**}] [**stats**]
5. **clear ip traffic** [**topology** {*name* | **all** | **base**}]

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.

	Command or Action	Purpose
Step 2	**show ip interface** [*type number*] [**topology** {*name* | **all** | **base**}] [**stats**] **Example:** `Device# show ip interface FastEthernet 1/10 stats`	(Optional) Displays IP traffic statistics for all interfaces or statistics related to the specified interface. • If you specify an interface type and number, information for that specific interface is displayed. If you specify no optional arguments, information for all the interfaces is displayed. • If the **topology** *name* keyword and argument are used, statistics are limited to the IP traffic for that specific topology. • The **base** keyword displays the IPv4 unicast base topology.
Step 3	**show ip traffic** [**topology** {*name* | **all** | **base**}] **Example:** `Device# show ip traffic topology VOICE`	(Optional) Displays global IP traffic statistics (an aggregation of all the topologies when MTR is enabled) or statistics related to a particular topology. • The **base** keyword is reserved for the IPv4 unicast base topology.
Step 4	**clear ip interface** *type number* [**topology** {*name* | **all** | **base**}] [**stats**] **Example:** `Device# clear ip interface FastEthernet 1/10 topology all`	(Optional) Resets interface-level IP traffic statistics. • If the **topology** keyword and a related keyword are not used, only the interface-level aggregate statistics are reset. • If all topologies need to be reset, use the **all** keyword as the topology name.
Step 5	**clear ip traffic** [**topology** {*name* | **all** | **base**}] **Example:** `Device# clear ip traffic topology all`	(Optional) Resets IP traffic statistics. • If no topology name is specified, global statistics are cleared.

../topics/Configuration Examples for IS-IS Support for MTR

Example: Activating an MTR Topology by Using IS-IS

The following example shows how to configure both the Multitopology Routing (MTR) topologies DATA and VIDEO and Intermediate System-to-Intermediate System (IS-IS) support for MTR. The DATA and VIDEO topologies are enabled on three IS-IS neighbors in a network.

Device 1

```
global-address-family ipv4
 topology DATA
```

```
 topology VOICE
 end
interface Ethernet 0/0
 ip address 192.168.128.2 255.255.255.0
 ip router isis
 topology ipv4 DATA
 isis topology disable
 topology ipv4 VOICE
 end
router isis
 net 33.3333.3333.3333.00
 metric-style wide
 address-family ipv4
  topology DATA tid 100
  topology VOICE tid 200
  end
```

Device 2

```
global-address-family ipv4
 topology DATA
 topology VOICE
 all-interfaces
  forward-base
  maximum routes 1000 warning-only
  shutdown
  end
interface Ethernet 0/0
 ip address 192.168.128.1 255.255.255.0
 ip router isis
 topology ipv4 DATA
  isis topology disable
  topology ipv4 VOICE
  end
interface Ethernet 1/0
 ip address 192.168.130.1 255.255.255.0
 ip router isis
 topology ipv4 DATA
  isis topology disable
  topology ipv4 VOICE
  end
router isis
 net 32.3232.3232.3232.00
 metric-style wide
 address-family ipv4
  topology DATA tid 100
  topology VOICE tid 200
  end
```

Device 3

```
global-address-family ipv4
 topology DATA
  topology VOICE
  all-interfaces
  forward-base
  maximum routes 1000 warning-only
  shutdown
  end
interface Ethernet 1/0
 ip address 192.168.131.1 255.255.255.0
```

```
 ip router isis
 topology ipv4 DATA
  isis topology disable
  topology ipv4 VOICE
  end
router isis
 net 31.3131.3131.3131.00
 metric-style wide
 address-family ipv4
  topology DATA tid 100
  topology VOICE tid 200
  end
```

Entering the **show isis neighbors detail** command verifies topology translation with the IS-IS neighbor Device 1:

```
Device# show isis neighbors detail

System Id       Type Interface IP Address      State Holdtime Circuit Id
R1              L2   Et0/0      192.168.128.2   UP    28        R5.01
  Area Address(es): 33
  SNPA: aabb.cc00.1f00
  State Changed: 00:07:05
  LAN Priority: 64
  Format: Phase V
  Remote TID:  100, 200
  Local TID:   100, 200
```

Example: MTR IS-IS Topology in Interface Configuration Mode

The following example shows how to prevent the Intermediate System-to-Intermediate System (IS-IS) process from advertising interface Ethernet 1/0 as part of the DATA topology:

```
interface Ethernet 1/0
 ip address 192.168.130.1 255.255.255.0
 ip router isis
 topology ipv4 DATA
  isis topology disable
  topology ipv4 VOICE
  end
```

Additional References

Related Documents

Related Topic	Document Title
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
IS-IS concepts and tasks	*IP Routing: IS-IS Configuration Guide*

Related Topic	Document Title
Configuring a multicast topology	"MTR Support for Multicast" feature module in the *Multitopology Routing Configuration Guide*
Configure Multitopology IS-IS for IPv6	*IP Routing: IS-IS 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 IS-IS Support for MTR

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 IS-IS Support for MTR

Feature Name	Releases	Feature Information
IS-IS Support for MTR	12.2(33)SRB Cisco IOS XE Release 2.5	This feature provides Intermediate System-to-Intermediate System (IS-IS) support for multiple logical topologies over a single physical network. In Cisco IOS XE Release 2.5, support was added for the Cisco ASR 1000 Series Routers. The following commands were introduced or modified: **address-family ipv4**, **isis topology disable**, **show isis neighbors**, **topology**.