Cisco IOS Multi-Topology Routing Command Reference

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Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
http://www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Cisco IOS Multi-Topology Routing Command Reference

Multi-Topology Routing Commands

This document describes the commands used to configure Multi-Topology Routing with Cisco IOS software.

For information about configuration, see the *Cisco IOS Multi-Topology Routing Configuration Guide*.

address-family ipv4 (BGP)

To enter address family or router scope address family configuration mode to configure a routing session using standard IP Version 4 (IPv4) address prefixes, use the **address-family ipv4** command in router configuration or router scope configuration mode. To exit address family configuration mode and remove the IPv4 address family configuration from the running configuration, use the **no** form of this command.

Syntax Available Under Router Configuration Mode

address-family ipv4 [**mdt** | **multicast** | **tunnel** | **unicast** [**vrf** *vrf-name*] | **vrf** *vrf-name*]

no address-family ipv4 [**mdt** | **multicast** | **tunnel** | **unicast** [**vrf** *vrf-name*] | **vrf** *vrf-name*]

Syntax Available Under Router Scope Configuration Mode

address-family ipv4 [**mdt** | **multicast** | **unicast**]

no address-family ipv4 [**mdt** | **multicast** | **unicast**]

Syntax Description

mdt	(Optional) Specifies an IPv4 multicast distribution tree (MDT) address family session.
multicast	(Optional) Specifies IPv4 multicast address prefixes.
tunnel	(Optional) Specifies an IPv4 routing session for multipoint tunneling.
unicast	(Optional) Specifies IPv4 unicast address prefixes. This is the default.
vrf *vrf-name*	(Optional) Specifies the name of the VPN routing and forwarding (VRF) instance to associate with subsequent IPv4 address family configuration mode commands.

Command Default

IPv4 address prefixes are not enabled.

Command Modes

Router configuration (config-router)
Router scope configuration (config-router-scope)

Command History

Release	Modification
12.0(5)T	This command was introduced. This command replaced the **match nlri** and **set nlri** commands.
12.0(28)S	This command was integrated into Cisco IOS Release 12.0(28)S, and the **tunnel** keyword was added.
12.0(29)S	The **mdt** keyword was added.
12.0(30)S	Support for the Cisco 12000 series Internet router was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(31)SB2	This command was integrated into Cisco IOS Release 12.2(31)SB2.
12.2(33)SRB	Support for the router scope configuration mode was added.

Release	Modification
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SB	This command was integrated into Cisco IOS Release 12.2(33)SB.
Cisco IOS XE Release 2.1	This command was introduced on Cisco ASR 1000 Series Routers.
12.4(20)T	The **mdt** keyword was added.

Usage Guidelines

The **address-family ipv4** command replaces the **match nlri** and **set nlri** commands. The **address-family ipv4** command places the router in address family configuration mode (prompt: `config-router-af)`, from which you can configure routing sessions that use standard IPv4 address prefixes. To leave address family configuration mode and return to router configuration mode, type **exit**.

Note Routing information for address family IPv4 is advertised by default for each BGP routing session configured with the **neighbor remote-as** command unless you enter the **no bgp default ipv4-unicast** command before configuring the **neighbor remote-as** command.

The **tunnel** keyword is used to enable the tunnel subaddress family identifier (SAFI) under the IPv4 address family identifier. This SAFI is used to advertise the tunnel endpoints and the SAFI-specific attributes (which contain the tunnel type and tunnel capabilities). Redistribution of tunnel endpoints into the BGP IPv4 tunnel SAFI table occurs automatically when the tunnel address family is configured. However, peers need to be activated under the tunnel address family before the sessions can exchange tunnel information.

The **mdt** keyword is used to enable the MDT SAFI under the IPv4 address family identifier. This SAFI is used to advertise tunnel endpoints for inter-AS multicast VPN peering sessions.

If you specify a**ddress-family ipv4 multicast**, you will then specify the **network** *network-number* [**mask** *network-mask*] command. The **network** command advertises (injects) the specified network number and mask into the multicast BGP database. This route must exist in the forwarding table installed by an IGP (that is, by eigrp, ospf, rip, igrp, static, or is-is), but not bgp.

In Cisco IOS Release 12.2(33)SRB and later releases, the ability to use address family configuration under the router scope configuration mode was introduced. The scope hierarchy can be defined for BGP routing sessions and is required to support Multi-Topology Routing (MTR). To enter the router scope configuration mode, use the **scope** command, which can apply globally or for a specific VRF. When using the scope for a specific VRF, only the **unicast** keyword is available.

Examples

The following example places the router in address family configuration mode for the IPv4 address family:

```
Router(config)# router bgp 50000
Router(config-router)# address-family ipv4
Router(config-router-af)#
```

Multicast Example

The following example places the router in address family configuration mode and specifies only multicast address prefixes for the IPv4 address family:

```
Router(config)# router bgp 50000
Router(config-router)# address-family ipv4 multicast
Router(config-router-af)#
```

Unicast Example

The following example places the router in address family configuration mode and specifies unicast address prefixes for the IPv4 address family:

```
Router(config)# router bgp 50000
Router(config-router)# address-family ipv4 unicast
Router(config-router-af)#
```

VRF Example

The following example places the router in address family configuration mode and specifies **cisco** as the name of the VRF instance to associate with subsequent IPv4 address family configuration mode commands:

```
Router(config)# router bgp 50000
Router(config-router)# address-family ipv4 vrf cisco
Router(config-router-af)#
```

Note Use this form of the command, which specifies a VRF, only to configure routing exchanges between provider edge (PE) and customer edge (CE) devices.

Tunnel Example

The following example places the router in tunnel address family configuration mode:

```
Router(config)# router bgp 100
Router(config-router)# address-family ipv4 tunnel
Router(config-router-af)#
```

MDT Example

The following example shows how to configure a router to support an IPv4 MDT address-family session:

```
Router(config)# router bgp 45000
Router(config-router)# address-family ipv4 mdt
Router(config-router-af)#
```

Router Scope Configuration Mode Example

The following example shows how to configure the IPv4 address family under router scope configuration mode. In this example, the scope hierarchy is enabled globally. The router enters router scope address family configuration mode, and only multicast address prefixes for the IPv4 address family are specified:

```
Router(config)# router bgp 50000
Router(config-router)# scope global
Router(config-router-scope)# address-family ipv4 multicast
Router(config-router-scope-af)#
```

Related Commands

Command	Description
address-family ipv6	Places the router in address family configuration mode for configuring routing sessions, such as BGP, that use standard IPv6 address prefixes.
address-family vpnv4	Places the router in address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard VPN Version 4 address prefixes.
bgp default ipv4-unicast	Enables the IPv4 unicast address family on all neighbors.
neighbor activate	Enables the exchange of information with a BGP neighboring router.

Command	Description
neighbor remote-as	Adds an entry to the BGP or multiprotocol BGP neighbor table.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.

address-family ipv4 (EIGRP MTR)

To enter router address family configuration mode to configure the Enhanced Interior Gateway Routing Protocol (EIGRP) for Multi-Topology Routing (MTR), use the **address-family ipv4** command in router configuration mode. To remove the address family from the EIGRP configuration, use the **no** form of this command.

address-family ipv4 [**unicast** | **multicast** | **vrf** *vrf-name*] **autonomous-system** *as-number*

no address-family ipv4 [**unicast** | **multicast** | **vrf** *vrf-name*] **autonomous-system** *as-number*

Syntax Description

unicast	(Optional) Specifies the unicast subaddress family.
multicast	(Optional) Specifies the multicast subaddress family.
vrf *vrf-name*	(Optional) Specifies the name of the VRF.
autonomous-system *as-number*	Specifies the autonomous system number.

Command Default

This command is disabled by default.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **address-family ipv4** command is used to enter router address family or subaddress family configuration mode to configure the exchange of address-family and subaddress-family prefixes.

Note If Enhanced Routing and Forwarding is not available, then the **multicast** keyword is also not available.

Examples

The following example shows how to configure an IPv4 address family to associate with the MTR topology named VIDEO:

```
Router(config)# router eigrp mtr
Router(config-router)# address-family ipv4 autonomous-system 5
Router(config-router-af)# topology VIDEO tid 100
```

address-family ipv4 (IS-IS)

To enter router address family configuration mode under Intermediate System-to-Intermediate System (IS-IS) router configuration mode, use the **address-family ipv4** command in router configuration mode. To remove the address family or subaddress family configuration from the router configuration, use the **no** form of this command.

address-family ipv4 [**multicast** | **unicast**]

no address-family ipv4 [**multicast** | **unicast**]

Syntax Description

multicast	(Optional) Specifies multicast subaddress family prefixes.
unicast	(Optional) Specifies unicast subaddress family prefixes.

Command Default

Unicast subaddress family configuration mode is entered if no optional keywords are entered.

Command Modes

Router configuration (config-router)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **address-family ipv4** command is used to enter router address family or subaddress family configuration mode to configure the exchange of address-family and subaddress-family prefixes.

Examples

The following example show how to configure IS-IS to exchange IPv4 unicast prefixes in unicast subaddress family configuration mode:

```
Router(config)# router isis 1
Router(config-router)# address-family ipv4 unicast
Router(config-router-af)# end
```

address-family ipv4 (OSPF)

To enter router address family configuration mode under Open Shortest Path First (OSPF) router configuration mode, use the **address-family ipv4** command in router configuration mode. To remove the address family or subaddress family configuration from the router configuration, use the **no** form of this command.

address-family ipv4 [**multicast** | **unicast**]

no address-family ipv4 [**multicast** | **unicast**]

Syntax Description

multicast	(Optional) Specifies multicast subaddress family prefixes.
unicast	(Optional) Specifies unicast subaddress family prefixes.

Command Default

Unicast router subaddress family configuration mode is entered if no optional keywords are entered.

Command Modes

Router configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **address-family ipv4** command is used to enter router address family or router subaddress family configuration mode to configure the exchange of address-family and subaddress-family prefixes.

Examples

The following example show how to configure OSPF to exchange IPv4 unicast prefixes in unicast subaddress family configuration mode:

```
Router(config)# router ospf 1
Router(config-router)# address-family ipv4 unicast
Router(config-router-af)# end
```

Related Commands

Command	Description
area capability default-exclusion	Configures an OSPF process to allow interfaces to be excluded from the base topology.
ip ospf cost (MTR)	Configures the OSPF interface cost under a topology instance.
ip ospf topology disable	Prevents an OSPF process from advertising the interface as part of the topology.
topology (OSPF)	Configures an OSPF process to route IP traffic under the specified topology instance.

all-interfaces

To configure a topology instance to use all interfaces on a router, use the **all-interfaces** command in address family topology configuration mode. To remove all interfaces from the topology instance configuration, use the **no** form of this command.

all-interfaces

no all-interfaces

Syntax Description

This command has no arguments or keywords.

Command Default

This command is disabled by default. No interfaces are included in class-specific topologies unless explicitly configured.

The configuration applied with this command does not override the configuration applied at the interface level with the **topology** interface configuration command.

Command Modes

Address family topology configuration (config-af-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **all-interfaces** command is used to include or exclude all interfaces on the router from a global topology configuration.

Examples

The following example shows how to configure all local interfaces on the router to be used by the VOICE topology:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# all-interfaces
Router(config-af-topology)# end
```

Related Commands

Command	Description
maximum routes (MTR)	Sets the maximum number of routes that a topology instance will accept and install into the RIB.
shutdown	Temporarily disables a topology instance without removing the topology configuration.
topology (global)	Configures a topology instance.

area capability default-exclusion

To configure an Open Shortest Path First (OSPF) process to allow interfaces to be excluded from the base topology, use the **area capability default-exclusion** command in router configuration mode. To return the OSPF process to default operation, use the **no** form of this command.

area *area-id* **capability default-exclusion**

no area *area-id* **capability default-exclusion**

Syntax Description

area-id	Area ID number. This argument can be entered in the IP address format or as a number. The range of numbers that can entered for this argument is from 0 to 4294967295.

Command Default

The base topology cannot be excluded from an interface.

Command Modes

Router configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Examples

The following example shows how to configure OSPF to allow interfaces to be excluded from the base topology:

```
Router(config)# router ospf 1
Router(config-router)# area 10 default-cost 100
Router(config-router)# area 10 capability default-exclusion
Router(config-router)# end
```

Related Commands

Command	Description
address-family ipv4 (OSPF)	Configures address family and subaddress family IP prefix exchange.
ip ospf cost (MTR)	Configures the OSPF interface cost under a topology instance.
ip ospf topology disable	Prevents an OSPF process from advertising the interface as part of the topology.
priority (OSPF)	Sets the priority that an OSPF process assigns to a topology instance for SPF calculations.
topology (OSPF)	Configures an OSPF process to route IP traffic under the specified topology instance.

bgp tid

To configure a Border Gateway Protocol (BGP) routing session to accept routes with a specified Multi-Topology Routing (MTR) topology ID, use the **bgp tid** command in router scope address family topology configuration mode. To disassociate the topology ID from the BGP process, use the **no** form of this command.

bgp tid *number*

no bgp tid

Syntax Description

number	Topology ID number. Range is from 1 to 255.

Command Default

No ID is associated with an MTR topology instance.

Command Modes

Router scope address family topology configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **bgp tid** command is used to associate an ID with an MTR topology instance. Each topology must be configured with a unique topology ID. The topology ID is used to identify and group routes for each topology in BGP updates.

Examples

The following example shows how to configure a topology ID of 100 under the VOICE topology instance:

```
Router(config)# router bgp 50000
Router(config-router)# scope global
Router(config-router-scope)# address-family ipv4
Router(config-router-scope-af)# topology VOICE
Router(config-router-scope-af-topo)# bgp tid 100
Router(config-router-scope-af-topo)# end
```

Related Commands

Command	Description
clear ip bgp topology	Resets BGP neighbor session information under a topology instance.
neighbor translate-topology	Configures BGP to translate or move routes from a topology on another router to a topology on the local router.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.

Command	Description
show ip bgp	Displays entries in the BGP routing table.
topology (BGP)	Configures a BGP routing session to route IP traffic for a specified topology instance.

clear ip bgp topology

To reset Border Gateway Protocol (BGP) neighbor session information for a topology instance, use the **clear ip bgp topology** command in privileged EXEC mode.

clear ip bgp [**vrf** *vrf-name*] **topology** {***** | *topology-name*} {*as-number* | **dampening** [*network-address* [*network-mask*]] | **flap-statistics** [*network-address* [*network-mask*]] | **peer-group** *peer-group-name* | **table-map** | **update-group** [*number* | *ip-address*]} [**in** [**prefix-filter**] | **out** | **soft** [**in** [**prefix-filter**] | **out**]]

Syntax Description

vrf	(Optional) Specifies an instance of a routing table.
vrf-name	(Optional) Name of the Virtual Private Network (VPN) routing and forwarding (VRF) table to use for storing data.
*****	Clears session and peering information for all topology instances.
topology-name	Name of a topology instance.
autonomous-system-number	Autonomous system to clear.
dampening	Specifies that dampening statistic counters will be cleared.
network-address [*network-mask*]	(Optional) Network address and network mask to clear dampening or flap-statistic counters.
flap-statistics	Specifies that session flap statistic counters will be cleared.
peer-group *peer-group-name*	Clears peer group information for the specified peer group name.
table-map	Clears table-map configuration information.
update-group	Clears update group session information for the specified group number or IP address.
number	(Optional) Update group number.
ip-address	(Optional) IP address of peer for which update group session information is to be cleared.
in	(Optional) Initiates inbound reconfiguration. If neither the **in** keyword nor **out** keyword is specified, both inbound and outbound sessions are reset.
prefix-filter	(Optional) Clears the inbound prefix filter.
soft	(Optional) Initiates a soft reset. Does not tear down the session.
out	(Optional) Initiates outbound reconfiguration. If neither the **in** keyword nor **out** keyword is specified, both inbound and outbound sessions are reset.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
15.1(2)T	This command was modified. The **vrf** keyword and *vrf-name* argument were added.

Usage Guidelines

The **clear ip bgp topology** command clears BGP session information under the specified topology or for all topologies. This command can be used to initiate a hard reset or soft reconfiguration. A hard reset tears down and rebuilds the specified peering sessions and rebuilds the BGP routing tables. A soft reconfiguration uses stored prefix information to reconfigure and activate BGP routing tables without tearing down existing peering sessions. Soft reconfiguration uses stored update information, at the cost of additional memory for storing the updates, to allow you to apply new BGP policy without disrupting the network. Soft reconfiguration can be configured for inbound or outbound sessions.

Generating Updates from Stored Information

To generate new inbound updates from stored update information (rather than dynamically) without resetting the BGP session, you must preconfigure the local BGP router using the **neighbor soft-reconfiguration inbound** command. This preconfiguration causes the software to store all received updates without modification regardless of whether an update is accepted by the inbound policy. Storing updates is memory intensive and should be avoided if possible.

Outbound BGP soft configuration has no memory overhead and does not require any preconfiguration. You can trigger an outbound reconfiguration on the other side of the BGP session to make the new inbound policy take effect.

Use this command whenever any of the following changes occur:

- Additions or changes to the BGP-related access lists
- Changes to BGP-related weights
- Changes to BGP-related distribution lists
- Changes to BGP-related route maps

Dynamic Inbound Soft Reset

The route refresh capability, as defined in RFC 2918, allows the local router to reset inbound routing tables dynamically by exchanging route refresh requests to supporting peers. The route refresh capability does not store update information locally for non-disruptive policy changes. It instead relies on dynamic exchange with supporting peers. Route refresh is advertised through BGP capability negotiation. All BGP routers must support the route refresh capability.

To determine if a BGP router supports this capability, use the **show ip bgp neighbors** command. The following message is displayed in the output when the router supports the route refresh capability:

```
Received route refresh capability from peer.
```

If all BGP routers support the route refresh capability, use the **clear ip bgp topology** command with the **in** keyword. You need not use the **soft** keyword, because soft reset is automatically assumed when the route refresh capability is supported.

Note After configuring a soft reset (inbound or outbound), it is normal for the BGP routing process to hold memory. The amount of memory that is held depends on the size of routing tables and the percentage of memory chunks that are utilized. Partially used memory chunks will be used or released before more memory is allocated from the global router memory pool.

Examples

The following example shows how to configure soft reconfiguration for the inbound sessions with neighbors in the autonomous system 45000. The outbound sessions are unaffected.

```
Router# clear ip bgp topology VOICE 45000 soft in
```

Related Commands

Command	Description
bgp tid	Configures BGP to accept routes with a specified topology ID.
import topology	Configures BGP to import or move routes from one topology to another on the same router.
neighbor soft-reconfiguration	Configures the Cisco IOS software to start storing updates.
neighbor translate-topology	Configures BGP to translate or move routes from a topology on another router to a topology on the local router.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.
show ip bgp neighbors	Displays information about BGP and TCP connections to neighbors.
show ip bgp topology	Displays entries in the BGP routing tables for a topology instance.
topology (BGP)	Configures a process to route IP traffic under the specified topology instance.

clear ip eigrp topology

Note Effective with Cisco IOS Release 12.2(33)SRE, **clear ip eigrp topology** command is not available in Cisco IOS software.

To clear an Enhanced Interior Gateway Routing Protocol (EIGRP) process for a topology instance, use the **clear ip eigrp topology** command in privileged EXEC mode.

clear ip eigrp [*as-number*] **topology** [*topology-name*] *topo-entry* [*entry-mask*]

Syntax Description

as-number	(Optional) The autonomous system number to clear.
topology-name	(Optional) The name of the topology instance.
topo-entry	The topology table entry. The *topo-entry* argument is entered as an IP address.
entry-mask	(Optional) The topology table entry mask. The *entry-mask* argument is entered as a wild-card mask.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was removed.

Usage Guidelines

The **clear ip eigrp topology** command can be used to reset EIGRP process and session information for a specific topology.

Examples

The following example resets the EIGRP process under the VOICE topology and clears the topology table entry 10.32.40.2:

```
Router# clear ip eigrp topology VOICE 10.32.40.2
```

Related Commands

Command	Description
eigrp next-hop-self	Configures EIGRP to advertise itself as the next hop.
eigrp shutdown	Disables an EIGRP process under a topology interface configuration.
eigrp split-horizon	Configures split horizon under a topology interface configuration.
eigrp summary-address	Configures an EIGRP summary address under a topology configuration.

Command	Description
topology (EIGRP)	Configures an EIGRP process to route IP traffic under the specified topology instance.
topology (interface)	Configures an MTR topology instance on an interface.

clear ip interface

To reset interface-level statistics, use the **clear ip interface** command in privileged EXEC mode.

clear ip interface *type number* [**topology** {*name* | **all** | **base**}] [**stats**]

Syntax Description

type	Interface type.
number	Interface number.
topology	(Optional) Specifies topology statistics.
name	(Optional) Statistics related to a particular topology.
all	(Optional) Statistics for all topologies. This keyword can be used as the *name* argument.
base	(Optional) Clears base topology statistics.
stats	(Optional) Clears IP traffic statistics without topology awareness, that is, an aggregate of all topologies is cleared.

Command Default

If no topology is specified, only interface level aggregate statistics are reset.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

Use the **clear ip interface** command to reset interface-level statistics. If a topology name is specified, only the statistics for that topology are cleared. If all topologies need to be reset, use the **all** keyword as the topology name.

Examples

The following example shows how to clear statistics for all topologies:

```
Router# clear ip interface FastEthernet 1/10 topology all
```

clear ip route multicast

To clear multicast routes from the routing table, use the **clear ip route multicast** command in privileged EXEC mode.

clear ip route multicast {**vrf** *vrf-name* | ***** | *destination* [*mask*] | **dhcp** *ip-address*}

Syntax Description

vrf *vrf-name*	Specifies a VPN routing and forwarding (VRF) instance.
*****	Deletes all routes.
destination	Address of the destination network.
mask	(Optional) Mask of the destination network.
dhcp	Specifies a route added by a DHCP server or relay agent.
ip-address	Destination host route to delete.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.

Usage Guidelines

The **clear ip route multicast** command is used to clear specific multicast entries from the routing table or all multicast entries (by entering the * character).

Examples

The following example shows how to clear all multicast routes from the routing table:

```
Router# clear ip route multicast *
```

Related Commands

clear ip route topology	Clears entries from the routing table of a topology.
ip route topology	Configures static routing under a topology instance.

clear ip route topology

To clear entries from the routing table of a topology, use the **clear ip route topology** command in privileged EXEC mode.

clear ip route topology *topology-name* {***** | *destination* [*mask*] | **dhcp** *ip-address*}

Syntax Description

topology-name	Name of the topology.
*****	Specifies all routes.
destination	Address of the destination network.
mask	(Optional) Mask of the destination network.
dhcp	Specifies routes added by a DHCP relay agent.
ip-address	IP address of the DHCP relay agent.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **clear ip route topology** command is used to clear entries from the routing table for the specified topology instance or all topology instances (by entering the * character).

Examples

The following example shows how to clear all routes from the routing table of the VOICE topology:

```
Router# clear ip route topology VOICE *
```

Related Commands

ip route topology	Configures static routing under a topology instance.
ping (MTR)	Diagnoses basic network connectivity through a topology instance.
show ip protocols topology	Displays the configuration and state of active routing protocol processes under a topology instance.
show ip route topology	Displays the current state of a topology routing table.
show topology	Displays status and configuration information for topologies configured with MTR.

clear ip traffic (MTR)

To clear IP traffic statistics, use the **clear ip traffic** command in privileged EXEC mode.

clear ip traffic [**topology** {*name* | **all** | **base**}]

Syntax Description

topology	(Optional) Clears IP traffic statistics related to a particular topology.
name	(Optional) Topology name.
all	(Optional) Clears statistics for all topologies.
base	(Optional) Clears base topology statistics.

Command Default

If no topology name is specified, global statistics are cleared.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

Use the **clear ip traffic** command to clear IP traffic statistics. If no topology name is specified, global statistics are cleared. If a topology name is specified, only the statistics for that topology are cleared. If all topologies need to be reset, use the **all** keyword as the topology name.

Examples

The following example shows how to clear all topology statistics:

```
Router# clear ip traffic topology all
```

Related Commands

Command	Description
show ip traffic (MTR)	Displays statistics about IP traffic.

debug topology

To enable debugging for topology related events, use the **debug topology** command in privileged EXEC mode. To disable debugging output, use the **no** form of this command.

debug topology {**accounting** | **all** | **cache** | **db** | **event** | **ha** | **interface** | **locking** | **sb** | **state** | **topoid** | **vrf**}

no debug topology {**accounting** | **all** | **cache** | **db** | **event** | **ha** | **interface** | **locking** | **sb** | **state** | **topoid** | **vrf**}

Syntax Description

accounting	Enables debugging for topology accounting.
all	Enables debugging for all topology routing events.
cache	Enables debugging for topology ID cache activity.
db	Enables debugging for topology DB events.
event	Enables debugging for topology notification events.
ha	Enables debugging for topology High Availability (HA) events.
interface	Enables debugging for topology interface association.
locking	Enables debugging for topology client locking activity.
sb	Enables debugging for topology sub-block.
state	Enables debugging for topology state change events.
topoid	Enables debugging for topology ID management events.
vrf	Enables debugging for topology VRF association.

Command Default

Debugging output for topology related events is disabled.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Examples

The following example shows how to enable debugging for topology HA events:

```
Router# debug topology ha
```

Related Commands

Command	Description
show topology	Displays status and configuration information for topologies configured with MTR.

eigrp delay

To configure the delay value that Enhanced Interior Gateway Routing Protocol (EIGRP) uses for interface metric calculation, use the **eigrp delay** command in interface topology configuration mode. To return the delay value to the default, use the **no** form of this command.

eigrp *as-number* **delay** *value*

no eigrp *as-number* **delay** *value*

Syntax Description

as-number	Specifies the autonomous system number of the EIGRP process.
value	Specifies the delay value, in tens of microseconds. The value for this argument can be a number from 1 to 4294967295.

Command Default

Delay values are inherited from the global interface configuration.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **eigrp delay** command is used to set the interface delay value used by the EIGRP process for routing calculation.

Examples

The following example shows how to set the EIGRP delay calculation on Ethernet interface 0/0 to 100 milliseconds:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast VOICE
Router(config-if-topology)# eigrp 1 delay 100000
Router(config-if-topology)# end
```

Related Commands

Command	Description
topology (EIGRP)	Configures an EIGRP process to route IP traffic under the specified topology instance.
topology (interface)	Configures an MTR topology instance on an interface.

eigrp next-hop-self

To configure an Enhanced Interior Gateway Routing Protocol (EIGRP) process to advertise itself as the next hop when advertising routes under a topology instance, use the **eigrp next-hop-self** command in interface topology configuration mode. To configure EIGRP to advertise the source of the route as the next hop, use the **no** form of this command.

eigrp *as-number* **next-hop-self**

no eigrp *as-number* **next-hop-self**

Syntax Description

as-number	Autonomous system number of the EIGRP process.

Command Default

This command is enabled by default.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **eigrp next-hop-self** command is used to configure EIGRP next hop resolution. By default, EIGRP sets the next-hop to itself for routes it advertises, even if the route is advertised through the interface, from which it was learned. Entering the **no** form of this command configures EIGRP to advertise the IP address of the route source as the next hop.

Examples

The following example shows how to configure EIGRP process 1 to advertise the source of a route as the next hop under the topology VOICE:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast VOICE
Router(config-if-topology)# no eigrp 1 next-hop-self
Router(config-if-topology)# end
```

Related Commands

Command	Description
clear ip eigrp topology	Resets EIGRP process information for a topology.
topology (EIGRP)	Configures an EIGRP process to route IP traffic under the specified topology instance.
topology (interface)	Configures an MTR topology instance on an interface.

eigrp shutdown

To disable an Enhanced Interior Gateway Routing Protocol (EIGRP) process under a topology interface configuration, use the **eigrp shutdown** command in interface topology configuration mode. To restart the EIGRP process under a topology interface configuration, use the **no** form of this command.

eigrp *as-number* **shutdown**

no eigrp *as-number* **shutdown**

Syntax Description

as-number	Specifies the autonomous system number of the EIGRP process.

Command Default

The EIGRP process is in the no shutdown state.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **eigrp shutdown** command is used to disable an EIGRP process under an interface topology configuration without removing the EIGRP or topology configuration from the router.

Examples

The following example shows how to place the EIGRP process in a shutdown state:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast RED
Router(config-if-topology)# eigrp 1 delay 2000
Router(config-if-topology)# eigrp 1 split-horizon
Router(config-if-topology)# eigrp 1 shutdown
Router(config-if-topology)# end
```

Related Commands

Command	Description
clear ip eigrp	Resets EIGRP process and neighbor session information.
topology (EIGRP)	Configures an EIGRP process to route IP traffic under the specified topology instance.
topology (interface)	Configures an MTR topology instance on an interface.

eigrp split-horizon

To configure Enhanced Interior Gateway Routing Protocol (EIGRP) to use split horizon under a topology interface configuration, use the **eigrp split-horizon** command in interface topology configuration mode. To disable split horizon on the topology interface, use the **no** form of this command.

eigrp *as-number* **split-horizon**

no eigrp *as-number* **split-horizon**

Syntax Description

as-number	Specifies the autonomous system number of the EIGRP process.

Command Default

This command is enabled by default.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **eigrp split-horizon** command is used to enable or disable split horizon under the topology interface configuration.

Examples

The following example shows how to disable split horizon:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast VOICE
Router(config-if-topology)# no eigrp 1 split-horizon
Router(config-if-topology)# end
```

Related Commands

Command	Description
topology (EIGRP)	Configures an EIGRP process to route IP traffic under the specified topology instance.
topology (interface)	Configures an MTR topology instance on an interface.

eigrp summary-address

To configure an Enhanced Interior Gateway Routing Protocol (EIGRP) summary address under a topology interface configuration, use the **eigrp summary-address** command in interface topology configuration mode. To remove the summary address from the topology interface configuration, use the **no** form of this command.

eigrp *as-number* **summary-address** *ip-address wildcard-mask* [*distance*]

no eigrp *as-number* **summary-address** *ip-address wildcard-mask* [*distance*]

Syntax Description

as-number	Specifies the autonomous system number of the EIGRP process.
ip-address wildcard-mask	Specifies the summary address to be created. The mask is entered in the form of a wildcard mask.
distance	(Optional) Applies an administrative distance to routes summarized by this command. The value for this argument can be a number from 1 to 255.

Command Default

No summary addresses are predefined.

The default administrative distance metric for EIGRP is 90.

The default administrative distance for an EIGRP summary is 5.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **eigrp summary-address** command is used to configure a summary address on an interface for a topology instance. EIGRP summary routes are given an administrative distance value of 5 to allow the summary to be advertised without being installed in the routing table.

Examples

The following example shows how to create a summary of the 10.100.1.0/24 network and apply an administrative distance of 65 to routes summarized by this statement:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast RED
Router(config-if-topology)# eigrp 1 summary-address 10.100.1.0 0.0.0.255 65
Router(config-if-topology)# end
```

Related Commands

Command	Description
topology (EIGRP)	Configures an EIGRP process to route IP traffic under the specified topology instance.
topology (interface)	Configures an MTR topology instance on an interface.

exit-global-af

To exit global address family configuration mode and enter global configuration mode, use the **exit-global-af** command in global address family configuration mode.

exit-global-af

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values.

Command Modes

Global address family configuration (config-af)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **exit-global-af** command is used to exit global address family configuration mode without removing global topology configuration.

Examples

The following example shows how to exit from global address family configuration mode:

```
Router(config-af)# exit-global-af
Router(config)#
```

Related Commands

Command	Description
global-address-family ipv4	Enters enter address family topology configuration mode to configure MTR.
service-policy type class-routing	Attaches the service policy to the policy map for MTR traffic classification and to enable MTR.

exit-if-topology

To exit interface topology configuration mode, use the **exit-if-topology** command in interface topology configuration mode.

exit-if-topology

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Examples

The following example, starting in global configuration mode, shows how to exit interface topology configuration mode:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast RED
Router(config-if-topology)# exit-if-topology
Router(config-if-topology)# end
```

Related Commands

Command	Description
topology (interface)	Configures an MTR topology instance on an interface.

exit-topo

To exit address family topology configuration mode and enter global address family configuration mode, use the **exit-topo** command in address family topology configuration mode.

exit-topo

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values.

Command Modes

Address family topology configuration (config-af)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **exit-topo** command is used to exit from address family topology configuration mode.

Examples

The following example shows how to exit address family topology configuration mode and enter global address family configuration mode:

```
Router(config-af-topology)# exit-topo
Router(config-af)#
```

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a router.
forward-base	Configures the forwarding mode under a topology instance.
maximum routes (MTR)	Sets the maximum number of routes that a topology instance will accept and install into the RIB.
shutdown	Temporarily disables a topology instance without removing the topology configuration.
topology (global)	Configures a topology instance.

forward-base

To configure the forwarding mode under a topology instance, use the **forward-base** command in address family topology configuration mode. To return to strict forwarding mode, use the **no** form of this command.

forward-base

no forward-base

Syntax Description

This command has no arguments or keywords.

Command Default

Strict forwarding mode

Command Modes

Address family topology configuration (config-af-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **forward-base** command is used in incremental deployment.

The **forward-base** command is used to configure the forwarding rule, under which traffic is forwarded for a topology. MTR supports both full and incremental deployment configurations. For full deployment, MTR supports a strict forwarding mode (default) longest-match lookup in only the forwarding table of the corresponding class-specific topology. If no route is found, the packet is dropped. For incremental deployment, MTR supports a longest-match lookup first in the forwarding table for the corresponding class-specific topology, and subsequently, in the base topology if no class-specific entry is found. If a route is not found in the base topology, the packet is then dropped.

Examples

The following example shows how to configure strict forwarding mode under the VOICE topology:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# no forward-base
Router(config-af-topology)# end
```

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a router.
exit-topo	Exits routing topology configuration mode, and enters global address family topology configuration mode.

Command	Description
maximum routes (MTR)	Sets the maximum number of routes that a topology instance will accept and install into the RIB.
shutdown	Temporarily disables a topology instance without removing the topology configuration.
topology (global)	Configures a topology instance.

global-address-family ipv4

To enter global address family configuration mode to configure Multi-Topology Routing (MTR), use the **global-address-family ipv4** command in global configuration mode. To disable and remove all topology configuration from the router configuration, use the **no** form of this command.

global-address-family ipv4 [**multicast** | **unicast**]

no global-address-family ipv4 [**multicast** | **unicast**]

Syntax Description

multicast	(Optional) Enters multicast subaddress family configuration mode.
unicast	(Optional) Enters unicast subaddress family configuration mode. This is the default.

Command Default

Unicast global address family configuration mode is the default when no optional keywords are entered.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **global-address-family ipv4** command is used to enter global address family configuration mode to configure MTR. Global topology configurations are entered in this configuration mode. Independent routing and forwarding tables are maintained for each topology, allowing you to configure separate forwarding rules on a per-topology basis. Cisco Express Forwarding (CEF) and IP routing must be enabled before MTR can be configured. The **topology** (global) command is entered to configure the base or a class-specific topology.

To completely remove all topologies from the router configuration, use the **no** form of the **global-address-family ipv4** command in global configuration mode. To disable a topology without removing it from the configuration of the router, use the **shutdown** command in address family topology configuration mode. If the **no ip routing** global configuration command is used, all topology configuration is retained, but topologies will be operationally disabled.

Examples

The following example creates a topology instance named VOICE. The router is configured to use all interfaces for the VOICE topology.

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# all-interfaces
Router(config-af-topology)# end
```

The following example shows how to create a topology instance named VIDEO and places this topology in a shutdown state:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VIDEO
Router(config-af-topology)# shutdown
Router(config-af-topology)# end
```

Related Commands

Command	Description
exit-global-af	Exits global address family configuration and enters global configuration mode.
shutdown	Temporarily disables a topology instance without removing the topology configuration.
topology (global)	Configures a topology instance.

import topology

To configure Border Gateway Protocol (BGP) to import routes from one Multi-Topology Routing (MTR) topology to another on the same router, use the **import topology** command in router scope address family topology configuration mode. To disable the import configuration, use the **no** form of this command.

import topology {*topology-name* | **base**} [**route-map** *map-name*]

no import topology {*topology-name* | **base**} [**route-map** *map-name*]

Syntax Description

topology-name	Name of topology instance.
base	Imports routes from the base topology.
route-map *map-name*	(Optional) Specifies a route map to filter imported routes.

Command Default

No routes are imported from other topologies.

Command Modes

Router scope address family topology configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **import topology** command is used to configure BGP to import routes from one topology to another when multiple topologies are configured on the same router. The name of the class-specific topology or the base topology is specified when entering this command. Best-path calculations are run on the imported routes before they are installed into the topology routing information base (RIB). If a duplicate route is imported, BGP will select and install only one instance of the route per standard BGP best-path calculation behavior. This command also includes a **route-map** keyword to allow you to filter routes that are moved between class-specific topologies.

Examples

The following example configures BGP to import routes from a topology instance named VIDEO into the local topology instance. Imported routes are filtered through the route map named 10NET, which permits routes from the 10.0.0.0 network.

```
Router(config)# ip prefix-list 10 permit 10.0.0.0/8
Router(config)# route-map 10NET
Router(config-route-map)# match ip address prefix-list 10
Router(config-route-map)# exit
Router(config)# router bgp 50000
Router(config-router)# scope global
Router(config-router-scope)# address-family ipv4
Router(config-router-scope-af)# topology VOICE
Router(config-router-scope-af-topo)# import topology VIDEO route-map 10NET
Router(config-router-scope-af-topo)# end
```

Related Commands

Command	Description
bgp tid	Configures BGP to accept routes with a specified topology ID.
clear ip bgp topology	Resets BGP neighbor session information under a topology instance.
neighbor translate-topology	Configures BGP to translate or move routes from a topology on another router to a topology on the local router.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.
topology (BGP)	Configures a process to route IP traffic under the specified topology instance.

ip multicast rpf multitopology

To enable Multi-Topology Routing (MTR) support for IP multicast routing, use the **ip multicast rpf multitopology** command in global configuration mode. To disable MTR support for IP multicast routing, use the **no** form of this command.

ip multicast rpf multitopology

no ip multicast rpf multitopology

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.

Examples

The following example shows how to enable MTR support for IP multicast routing:

```
Router(config)# ip multicast-routing
Router(config)# ip multicast rpf multitopology
```

ip ospf cost (MTR)

To configure the Open Shortest Path First (OSPF) interface cost under a topology instance, use the **ip ospf cost** command in interface topology configuration mode. To remove the interface cost configuration, use the **no** form of this command.

ip ospf cost *value*

no ip ospf cost

Syntax Description

value	Cost for the interface. The value for this argument can be a number from 1 to 65535.

Command Default

The cost configured in interface configuration is inherited.

Command Modes

Interface topology configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Examples

The following example configures the interface cost to be 1000:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast DATA
Router(config-if-topology)# ip ospf cost 1000
Router(config-if-topology)# end
```

ip ospf topology disable

To prevent an Open Shortest Path First (OSPF) process from advertising the interface as part of the topology, use the **ip ospf topology disable** command in interface topology configuration mode. To enable the OSPF process to advertise the interface as a part of the topology, use the **no** form of this command.

ip ospf topology disable

no ip ospf topology disable

Syntax Description

This command has no arguments or keywords.

Command Default

The OSPF process advertises the interface as a part of the topology.

Command Modes

Interface topology configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **ip ospf topology disable** command is used to prevent an OSPF process from advertising the interface as a part of the topology, without removing the OSPF or topology configuration from the interface.

Examples

The following example disables OSPF routing under the topology instance named VOICE on Ethernet interface 0/0:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast VOICE
Router(config-if-topology)# ip ospf topology disable
Router(config-if-topology)# end
```

Related Commands

Command	Description
area capability default-exclusion	Configures an OSPF process to allow interfaces to be excluded from the MTR base topology.

ip route topology

To configure static routing under a topology instance, use the **ip route topology** command in global configuration mode. To remove the static route, use the **no** form of this command.

ip route topology *topology-name destination-address destination-mask* {*forwarding-address* | *interface* [*forwarding-address*]} [**dhcp**] [*distance*] [**multicast**] [**name** *name*] [**permanent**] [**tag** *value*] [**track** *number*]

no ip route topology *topology-name* {***** | *destination-address destination-mask* {*forwarding-address* | *interface* [*forwarding-address*]}}[**dhcp**] [*distance*] [**multicast**] [**name** *name*] [**permanent**] [**tag** *value*] [**track** *number*]

Syntax Description

topology-name	Name of the topology instance.
destination-address	IP address of the destination.
destination-mask	IP address mask of the destination.
forwarding-address	IP forwarding address (next hop) to the destination network.
interface	Interface type and interface number.
dhcp	(Optional) Enables a Dynamic Host Configuration Protocol (DHCP) server to assign a static route to a default gateway (option 3). • Specify the **dhcp** keyword for each routing protocol.
distance	(Optional) An administrative distance metric for the route.
multicast	(Optional) Configures the route as a multicast static route.
name *name*	(Optional) Applies a name to the specified route.
permanent	(Optional) Specifies that the route will not be removed, even if the interface is shut down.
tag *value*	(Optional) Tag value that can be used as a “match” value for controlling redistribution via route maps.
track *number*	(Optional) Installs the static route based on the conditions set for the tracked object. The **number** argument specifies an object number, which can be a number from 1 to 500.
*	Specifies all static routes. This keyword can be entered only with the **no** form of this command.

Command Default

No static route is configured.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **ip route topology** command is used to configure static routing under a topology instance. The global topology name is entered when the static route is created in global configuration mode.

Examples

The following example configures a static route to the 10.0.0.0 network through Ethernet interface 0/0:

```
Router(config)# ip route topology VOICE 10.0.0.0 255.0.0.0 Ethernet 0/0
```

Related Commands

Command	Description
clear ip route topology	Clears entries from the routing table of a topology.
ping (MTR)	Diagnoses basic network connectivity through a topology instance.
show ip protocols topology	Displays the configuration and state of active routing protocol processes under a topology instance.
show ip route topology	Displays the current state of a topology routing table.
show topology	Displays status and configuration information for topologies configured with MTR.

ip topology-accounting

To enable topology accounting for all IPv4 unicast topologies in the VPN Routing/Forwarding (VRF) associated with a particular interface, use the **ip topology-accounting** command in interface configuration mode. To disable topology accounting, use the **no** form of this command.

ip topology-accounting

no ip topology-accounting

Syntax Description

This command has no arguments or keywords.

Command Default

No topology accounting statistics are collected.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

This command enables topology accounting for all IPv4 unicast topologies in the VRF associated with a particular interface regardless of whether those topologies are enabled on the interface or not. In Cisco IOS release 12.2(33)SRB, this topology accounting is only supported for the default VRF.

Examples

The following example shows how to enable topology accounting on FastEthernet interface 1/10:

```
Router(config)# interface FastEthernet 1/10
Router(config-if)# ip topology-accounting
```

Related Commands

Command	Description
topology-accounting	Enables topology accounting on all of the interfaces in the global address family.

isis topology disable

To prevent an Intermediate System-to-Intermediate System (IS-IS) process from advertising the interface as part of the topology, use the **isis topology disable** command in interface topology configuration mode. To enable the IS-IS process to advertise the interface as a part of the topology, use the **no** form of this command.

isis topology disable

no isis topology disable

Syntax Description

This command has no arguments or keywords.

Command Default

The IS-IS process advertises the interface as a part of the topology.

Command Modes

Interface topology configuration (config-if-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **isis topology disable** command is used to prevent an IS-IS process from advertising the interface as a part of the topology without removing the IS-IS or topology configuration from the interface.

Examples

The following example disables IS-IS routing under the topology instance named VOICE on Ethernet interface 0/0:

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 unicast VOICE
Router(config-if-topology)# isis topology disable
Router(config-if-topology)# end
```

Related Commands

Command	Description
address-family (IS-IS)	Configures the exchange of address family and subaddress family prefixes.
topology (interface)	Configures an MTR topology instance on an interface.
topology (IS-IS)	Configures an IS-IS process to route IP traffic under the specified topology instance.

maximum routes (MTR)

To set the maximum number of routes that a topology instance will accept and install into the routing information base (RIB), use the **maximum routes** command in address family topology configuration mode. To remove the route limit for the topology instance, use the **no** form of this command.

maximum routes *number* [*threshold* [**reinstall** *threshold*] | **warning-only**]

no maximum routes *number* [*threshold* [**reinstall** *threshold*] | **warning-only**]

Syntax Description

number	Maximum number of routes. The value for this argument can be a number from 1 to 4294967295.
threshold	(Optional) Threshold percentage, at which warning messages are generated. The value that can be entered for this argument is a number from 1 to 100.
reinstall *threshold*	(Optional) Configures the threshold percentage, at which routes are reinstalled into the routing table. The value that can be entered for this argument is a number from 1 to 100.
warning-only	(Optional) Configures the router to only display a warning when the maximum route limit has been reached or exceeded.

Command Default

No default behavior or values.

Command Modes

Address family topology configuration (config-af-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **maximum routes** command is used to set a limit for the number of routes that will be accepted for a topology instance and installed into the RIB. This command can be configured to set the absolute maximum limit, to generate warning messages when the specified percentage of the limit has been reached, and to configure the percentage (low-water mark), at which routes are reinstalled into the RIB after the maximum limit has been reached.

Examples

The following example shows how to configure the router to accept a maximum of 10000 routes for the VOICE topology and to generate warning messages when 80 percent of the maximum limit has been reached. This example also configures the router to accept routes after the limit has been exceeded but then receded to 40 percent of the maximum number.

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# maximum routes 10000 80 reinstall 40
Router(config-af-topology)# end
```

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a router.
exit-topo	Exits routing topology configuration mode, and enters global address family topology configuration mode.
forward-base	Configures the forwarding mode under a topology instance.
shutdown	Temporarily disables a topology instance without removing the topology configuration.
topology (global)	Configures a topology instance.

neighbor translate-topology

To configure Border Gateway Protocol (BGP) to translate or move routes from a topology on another router to a topology on the local router, use the **neighbor translate-topology** command in router scope address family topology configuration mode. To disable the topology translation configuration, use the **no** form of this command.

neighbor *ip-address* **translate-topology** *number*

no neighbor *ip-address* **translate-topology** *number*

Syntax Description

ip-address	IP address of the neighbor.
number	Topology ID of the neighbor. Range is from 1 to 4095.

Command Default

No routes are translated from a topology on another router.

Command Modes

Router scope address family topology configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **neighbor translate-topology** command is used to translate or move routes from a Multi-Topology Routing (MTR) class-specific topology on a neighbor router to the local topology under which the BGP session is configured. The topology ID identifies the class-specific topology of the neighbor. The routes in the class-specific topology of the neighbor are moved into a local class-specific topology RIB. BGP performs best-path calculation on imported routes and installs these routes into the local class-specific RIB. If a duplicate route is translated, BGP will select and install only one instance of the route per standard BGP best-path calculation behavior.

Examples

The following example shows how to configure BGP to translate the topology with the 255 ID from the 192.168.3.1 neighbor:

```
Router(config)# router bgp 50000
Router(config-router)# scope global
Router(config-router-scope)# bgp default ipv4-unicast
Router(config-router-scope)# neighbor 192.168.3.1 remote-as 45000
Router(config-router-scope)# address-family ipv4 unicast
Router(config-router-scope-af)# topology VOICE
Router(config-router-scope-af-topo)# bgp tid 100
Router(config-router-scope-af-topo)# neighbor 192.168.3.1 activate
Router(config-router-scope-af-topo)# neighbor 192.168.3.1 translate-topology 255
Router(config-router-scope-af-topo)# end
```

Related Commands

Command	Description
bgp tid	Configures BGP to accept routes with a specified topology ID.
clear ip bgp topology	Resets BGP neighbor session information under a topology instance.
import topology	Configures BGP to import or move routes from one topology to another on the same router.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.
topology (BGP)	Configures a process to route IP traffic under the specified topology instance.

neighbor transport

To enable a TCP transport session option for a Border Gateway Protocol (BGP) session, use the **neighbor transport** command in router or address family configuration mode. To disable a TCP transport session option for a BGP session, use the **no** form of this command.

neighbor {*ip-address* | *peer-group-name*} **transport** {**connection-mode** {**active** | **passive**} | **path-mtu-discovery** [**disable**] | **multi-session** | **single-session**}

no neighbor {*ip-address* | *peer-group-name*} **transport** {**connection-mode** | **path-mtu-discovery** | **multi-session** | **single-session**}

Syntax Description

ip-address	IP address of the BGP neighbor.
peer-group-name	Name of a BGP peer group.
connection-mode	Specifies the type of connection (active or passive).
active	Specifies an active connection.
passive	Specifies a passive connection.
path-mtu-discovery	Enables TCP transport path maximum transmission unit (MTU) discovery. TCP path MTU discovery is enabled by default.
multi-session	Enables a separate TCP transport session for each address family.
single-session	Enables all address families to use a single TCP transport session.
disable	Disables TCP path MTU discovery.

Command Default

If this command is not configured, TCP path MTU discovery is enabled by default, but no other TCP transport session options are enabled.

Command Modes

Router configuration (config-router)
Address family configuration (config-router-af)

Command History

Release	Modification
12.4	This command was introduced.
12.2(33)SRA	This command was modified. The **path-mtu-discovery** keyword was added.
12.2(33)SRB	This command was modified. The **multi-session**, **single-session**, and **disable** keywords were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.4(20)T	This command was modified. The **path-mtu-discovery** keyword was added.

Usage Guidelines

This command is used to specify various transport options. An active or passive transport connection can be specified for a BGP session. TCP transport path MTU discovery can be enabled to allow a BGP session to take advantage of larger MTU links. Use the **show ip bgp neighbors** command to determine whether TCP path MTU discovery is enabled.

In Cisco IOS Release 12.2(33)SRB and later releases, options can be specified for the transport of address family traffic using a single TCP session or to enable a separate TCP session for each address family. Multiple TCP sessions are used to support Multi-Topology Routing (MTR), and the single session option is available for backwards compatibility for non-MTR configurations and for scalability purposes.

In Cisco IOS Release 12.2(33)SRB and later releases, the ability to disable TCP path MTU discovery, for a single neighbor or for an inheriting peer or peer group, was added. If you use the **disable** keyword to disable discovery, discovery is also disabled on any peer or peer group that inherits the template in which you disabled discovery.

The following example shows how to configure the TCP transport connection to be active for a single internal BGP (iBGP) neighbor:

```
router bgp 45000
 neighbor 172.16.1.2 remote-as 45000
 neighbor 172.16.1.2 activate
 neighbor 172.16.1.2 transport connection-mode active
 end
```

The following example shows how to configure the TCP transport connection to be passive for a single external BGP (eBGP) neighbor:

```
router bgp 45000
 neighbor 192.168.1.2 remote-as 40000
 neighbor 192.168.1.2 activate
 neighbor 192.168.1.2 transport connection-mode passive
 end
```

The following example shows how to disable TCP path MTU discovery for a single BGP neighbor:

```
router bgp 45000
 neighbor 172.16.1.2 remote-as 45000
 neighbor 172.16.1.2 activate
 no neighbor 172.16.1.2 transport path-mtu-discovery
 end
```

The following example shows how to reenable TCP path MTU discovery for a single BGP neighbor, if TCP path MTU discovery is disabled:

```
router bgp 45000
 neighbor 172.16.1.2 remote-as 45000
 neighbor 172.16.1.2 activate
 neighbor 172.16.1.2 transport path-mtu-discovery
 end
```

The following example shows how to enable a separate TCP session for each address family for an MTR topology configuration:

```
router bgp 45000
 scope global
  neighbor 172.16.1.2 remote-as 45000
  neighbor 172.16.1.2 transport multi-session
  address-family ipv4
   topology VIDEO
   bgp tid 100
   neighbor 172.16.1.2 activate
   end
```

The following example shows how to disable TCP path MTU discovery and verify that it is disabled:

```
router bgp 100
 bgp log-neighbor-changes
 timers bgp 0 0
 redistribute static
 neighbor 10.4.4.4 remote-as 100
 neighbor 10.4.4.4 update-source Loopback 0
!end

Router# show ip bgp neighbors 10.4.4.4 | include path

    Used as bestpath:             n/a          0
    Used as multipath:            n/a          0
  Transport(tcp) path-mtu-discovery is enabled
Option Flags: nagle, path mtu capable
Router#

Router# configure terminal
Router(config)# router bgp 100

Router(config-router)# neighbors 10.4.4.4 transport path-mtu-discovery disable
Router(config-router)# end

Router# show ip bgp neighbor 10.4.4.4 | include path

    Used as bestpath:             n/a          0
    Used as multipath:            n/a          0
  Transport(tcp) path-mtu-discovery is disabled
```

Related Commands

Command	Description
bgp tid	Configures BGP to accept routes with a specified topology ID.
bgp transport	Enables transport session parameters globally for all BGP neighbor sessions.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.
show ip bgp neighbors	Displays information about BGP and TCP connections to neighbors.
topology (BGP)	Configures a process to route IP traffic under the specified topology instance.

ping (MTR)

To ping a destination within a specific topology for Multi-Topology Routing (MTR), use the **ping** command in user EXEC or privileged EXEC mode.

ping [**vrf** *vrf-name* | **topology** *topology-name*] *protocol* [*target-address*] [*source-address*]

Syntax Description

vrf *vrf-name*	(Optional) Specifies the name of a VPN routing and forwarding (VRF) instance.
topology *topology-name*	(Optional) Specifies the name of a topology.
protocol	Supported protocol. The default is IP. If a protocol is not specified at the command line, it will be required in the **ping** system dialog.
target-address	(Optional) Target IP address or hostname of the system to ping. If a target IP address or a hostname is not specified at the command line, it will be required in the **ping** system dialog.
source-address	(Optional) Source address initiating the ping. If a source address is not specified at the command line, it will be required in the **ping** system dialog.

Command Default

No default behavior or values.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **ping (MTR)** command is used to send an echo request to a topology instance. The functionality of this command is similar to the standard **ping** command used in Cisco IOS software. Ping output can help you evaluate path-to-host reliability, delays over the path, and whether the host can be reached or is functioning.

The **topology** *topology-name* keyword and argument and the DiffServ Code Point (DSCP) option in the extended ping system dialog are displayed only if there is a topology configured on the router.

If you enter the **ping** command without any other syntax (**ping** <cr>), an interactive system dialog prompts you for the additional syntax appropriate to the protocol you specify (see the "Examples" section).

Examples

After you enter the **ping** command in privileged EXEC mode, the system prompts you for a protocol. The default protocol is IP.

If you enter a hostname or address on the same line as the **ping** command, the default action is taken as appropriate for the protocol type of that name or address.

The following example is sample dialog from the **ping** command using default values. The specific dialog varies somewhat from protocol to protocol.

```
Router# ping

Protocol [ip]:
Target IP address: 192.168.7.27
Repeat count [5]:
Datagram size [100]:
Timeout in seconds [2]:
Extended commands [n]:y
Source address of interface: 10.0.20.1
DSCP Value [0]:
! The Type of Service (TOS) is displayed below only if the DSCP value is 0.
Type of Service [0]:
Set DF bit in IP header? [no]:
Validate reply data? [no]:
Data pattern [0xABCD]:
Loose, Strict, Record, Timestamp, Verbose [none]:
Sweep range of sizes [n]:
Type escape sequence to abort.
Sending 5, 100-byte ICMP Echos to 192.168.7.27, timeout is 2 seconds:
!!!!!
Success rate is 100 percent, round-trip min/avg/max = 1/2/4 ms
```

Table 1 describes the significant fields shown in the display.

Table 1 ping Field Descriptions for IP

Field	Description
Protocol [ip]:	Prompts for a supported protocol. Default is IP.
Target IP address:	Prompts for the IP address or hostname of the destination node you plan to ping. If you have specified a supported protocol other than IP, enter an appropriate address for that protocol here. Default: none.
Repeat count [5]:	Number of ping packets that will be sent to the destination address. Default: 5.
Datagram size [100]:	Size of the ping packet (in bytes). Default: 100 bytes.
Timeout in seconds [2]:	Timeout interval. Default: 2 (seconds).
Extended commands [n]:	Specifies whether a series of additional commands appears.
DSCP Value [10]:	DiffServ Code Point. Six bits in the ToS. These are the bits used to mark the packet.
Sweep range of sizes [n]:	Allows you to vary the sizes of the echo packets being sent. This capability is useful for determining the minimum sizes of the maximum transmission units (MTUs) configured on the nodes along the path to the destination address. Packet fragmentation contributing to performance problems can then be reduced.

Table 1 ping Field Descriptions for IP (continued)

Field	Description
!!!!!	Each exclamation point (!) indicates receipt of a reply. A period (.) indicates that the network server timed out while waiting for a reply. Other characters may appear in the ping output display, depending on the protocol type.
Success rate is 100 percent	Percentage of packets successfully echoed back to the router. Anything less than 80 percent is usually considered problematic.
round-trip min/avg/max = 1/2/4 ms	Round-trip travel time intervals for the protocol echo packets, including minimum/average/maximum (in milliseconds).

Related Commands

Command	Description
clear ip route topology	Clears entries from the routing table of a topology.
ip route topology	Configures static routing under a topology instance.
show ip protocols topology	Displays the configuration and state of active routing protocol processes under a topology instance.
show ip route topology	Displays the current state of a topology routing table.
show topology	Displays status and configuration information for topologies configured with MTR.

policy-map type class-routing ipv4 unicast

To create or modify a policy map for Multi-Topology Routing (MTR) and enter policy map configuration mode, use the **policy-map type class-routing ipv4 unicast** command in global configuration mode. To delete the policy map, use the **no** form of this command.

policy-map type class-routing ipv4 unicast *policy-map-name*

no policy-map type class-routing ipv4 unicast *policy-map-name*

Syntax Description

policy-map-name	Name of the MTR policy map.

Command Default

An MTR policy map name is not created.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The policy map name created by the **policy-map type class-routing ipv4 unicast** command is referenced by the **service-policy type class-routing** command to enable MTR.

Examples

In the following example, an MTR policy map named BLUE is created that will be attached to the service policy to enable MTR:

```
Router(config)# policy-map type class-routing ipv4 unicast BLUE
Router(config-pmap)# class DATA
Router(config-pmap-c)# select-topology VOICE
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# global-address-family ipv4
Router(config-af)# service-policy type class-routing BLUE
Router(config-af)# end
```

Related Commands

Command	Description
service-policy type class-routing	Attaches the service policy to the policy map for MTR traffic classification and enables MTR.

priority (OSPF)

To set the priority that an Open Shortest Path First (OSPF) process assigns to a topology instance for shortest path first (SPF) calculations, use the **priority** command in router address family topology configuration mode. To return the priority to the default value, use the **no** form of this command.

priority *number*

no priority

Syntax Description

number	Priority number for a topology instance. The range is from 0 to 127. The default number is 64.

Command Default

The default priority number is 64.

Command Modes

Router address family topology configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **priority** command is used to set the OSPF processing order for topology instances when an SPF calculation is scheduled and ready to run for multiple topologies. The topology with the highest priority number is processed first. The default priority value is 64.

Examples

The following example assigns the VOICE topology instance the highest possible priority for SPF calculations:

```
Router(config)# router ospf 1
Router(config-router)# address-family ipv4
Router(config-router-af)# topology VOICE tid 10
Router(config-router-af-topology)# priority 127
Router(config-router-af-topology)# end
```

Related Commands

Command	Description
address-family (OSPF)	Configures address family and subaddress family IP prefix exchange.
topology (OSPF)	Configures an OSPF process to route IP traffic under the specified topology instance.

router eigrp (MTR)

To configure the Enhanced Interior Gateway Routing Protocol (EIGRP) process for Multi-Topology Routing (MTR) and enter router configuration mode, use the **router eigrp** command in global configuration mode. To shut down an EIGRP routing process, use the **no** form of this command.

router eigrp *block-name*

no router eigrp *block-name*

Syntax Description

block-name	Routing configuration block name.

Command Default

This command is disabled by default.

Command Modes

Global configuration (config)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **router eigrp** *name* command allows access to MTR topology commands in router address family configuration mode. The topology commands are blocked if using the legacy **router eigrp** *as-number* command. You can use the **router eigrp** *name* command if MTR is not configured, but the topology defaults to the base topology.

Examples

The following example shows how to configure EIGRP for MTR and how to configure an IPv4 address family to associate with the MTR service topology named VIDEO:

```
Router(config)# router eigrp mtr
Router(config-router)# address-family ipv4 autonomous-system 5
Router(config-router-af)# topology VIDEO tid 100
```

Related Commands

Command	Description
router eigrp	Configures the EIGRP process.

route-replicate

To enable the replication of routes from one topology to another, use the **route-replicate** command in address family topology configuration mode. To disable route replication, use the **no** form of this command.

route-replicate from {**multicast** | **unicast**} [**topology** {**base** | *name*}] *protocol* [**route-map** *map-tag* | **vrf** *name*]

no route-replicate from {**multicast** | **unicast**} [**topology** {**base** | *name*}] *protocol* [**route-map** *map-tag* | **vrf** *name*]

Syntax Description

from	Specifies from which topology route replication is enabled.
multicast	Specifies a multicast subaddress family identifier (SAFI).
unicast	Specifies a unicast SAFI.
topology	(Optional) Specifies the source topology.
base	The base topology.
name	The topology instance name.
protocol	The owning protocol that is the source of the route. Valid keywords include: • **all**—Specifies all routes. • **bgp**—Specifies Border Gateway Protocol. An autonomous system number must be specified with this keyword. The range for the system number is 1 to 65535. • **eigrp**—Specifies Enhanced Interior Gateway Routing Protocol. An autonomous system number or a routing configuration block name must be specified with this keyword. The range for the system number is 1 to 65535; the block name can be up to 32 characters in length. • **isis**—Specifies ISO Intermediate System-to-Intermediate System (IS-IS). An optional ISO area routing tag or the **route-map** keyword can be used. • **mobile**—Specifies mobile routes. The optional **route-map** keyword can be used. • **odr**—Specifies on-demand stub routes. The optional **route-map** keyword can be used. • **ospf**—Specifies Open Shortest Path First (OSPF). A process ID must be specified with this keyword. The range for the ID is 1 to 65535. The optional **route-map** keyword or **vrf** keyword and *name* argument can be used. • **rip**—Specifies Routing Information Protocol. The optional **route-map** keyword and *map-tag* argument can be used. • **static**—Specifies static routes. The optional **route-map** keyword and *map-tag* argument can be used.
route-map *map-tag*	(Optional) Specifies a route map filter.
vrf *name*	(Optional) Specifies a VPN routing and forwarding (VRF) instance name.

Command Default Route replication is disabled.

Command Modes Address family topology configuration (config-af-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines Use this command to replicate routes from one topology to another. Route replication supports legacy multicast behavior and may be used to support scenarios in which not all protocols support multiple topologies.

For the **multicast** and **unicast** keywords, the address family identifier (AFI) is the same as the AFI of the destination table.

If the forwarding mode of the destination topology is set to incremental mode (forward-base), the route replication configuration commands are rejected.

If the **mobile**, **odr**, **rip**, or **static** keyword is used for the *protocol* argument, the optional **vrf** keyword and *name* argument cannot be used.

Examples The following example shows how to configure the multicast topology to replicate OSPF routes from the VOICE topology. The routes are filtered through the map1 route map before they are installed in the multicast routing table.

```
Router(config)# ip multicast-routing
Router(config)# ip multicast rpf multitopology
Router(config)# global-address-family ipv4 multicast
Router(config-af)# topology base
Router(config-af-topology)# route-replicate from unicast topology VOICE ospf 3 route-map
map1
```

scope

To define the scope for a Border Gateway Protocol (BGP) routing session and to enter router scope configuration mode, use the **scope** command in router configuration mode. To remove the scope configuration, use the **no** form of this command.

scope {**global** | **vrf** *vrf-name*}

no scope {**global** | **vrf** *vrf-name*}

Syntax Description

global	Configures BGP to use the global routing table or a specific topology table.
vrf	Configures BGP to use a specific VRF routing table.
vrf-name	Name of an existing VRF.

Command Default

No scope is defined for a BGP routing session.

Command Modes

Router configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

A new configuration hierarchy, named scope, has been introduced into the BGP protocol. To implement Multi-Topology Routing (MTR) support for BGP, the scope hierarchy is required, but the scope hierarchy is not limited to MTR use. The scope hierarchy introduces some new configuration modes such as router scope configuration mode. Router scope configuration mode is entered by configuring the **scope** command in router configuration mode, and a collection of routing tables is created when this command is entered. The scope is configured to isolate routing calculation for a single network (globally) or on a per-VRF basis, and BGP commands configured in routing scope configuration mode are referred to as scoped commands. The scope hierarchy can contain one or more address families.

The BGP command-line interface (CLI) has been modified to provide backwards compatibility for pre-MTR BGP configuration and to provide a hierarchal implementation of MTR. From router scope configuration mode, MTR is configured first by entering the **address-family** command to enter the desired address family and then by entering the **topology** command to define the topology

Note Configuring a scope for a BGP routing process removes CLI support for pre-MTR-based configuration.

Examples

The following example defines a global scope that includes both unicast and multicast topology configurations. Another scope is specifically defined only for the VRF named DATA.

```
Router(config)# router bgp 45000
Router(config-router)# scope global
Router(config-router-scope)# bgp default ipv4-unicast
```

```
Router(config-router-scope)# neighbor 172.16.1.2 remote-as 45000
Router(config-router-scope)# neighbor 192.168.3.2 remote-as 50000
Router(config-router-scope)# address-family ipv4 unicast
Router(config-router-scope-af)# topology VOICE
Router(config-router-scope-af)# bgp tid 100
Router(config-router-scope-af)# neighbor 172.16.1.2 activate
Router(config-router-scope-af)# exit
Router(config-router-scope)# address-family ipv4 multicast
Router(config-router-scope-af)# topology base
Router(config-router-scope-af-topo)# neighbor 192.168.3.2 activate
Router(config-router-scope-af-topo)# exit
Router(config-router-scope-af)# exit
Router(config-router-scope)# exit
Router(config-router)# scope vrf DATA
Router(config-router-scope)# neighbor 192.168.1.2 remote-as 40000
Router(config-router-scope)# address-family ipv4
Router(config-router-scope-af)# neighbor 192.168.1.2 activate
Router(config-router-scope-af)# end
```

Related Commands

Command	Description
bgp tid	Configures BGP to accept routes with a specified topology ID.
topology (BGP)	Configures a process to route IP traffic under the specified topology instance.

select-topology

To attach the policy map to the topology, use the **select-topology** command in policy map class configuration mode. To remove the association of the policy map with the topology, use the **no** form of this command.

select-topology *topology-name*

no select-topology *topology-name*

Syntax Description

topology-name	Name of the topology.

Command Default

No policy map is attached to the topology.

Command Modes

Policy map class configuration (config-pmap-c)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Examples

In the following example, the topology VOICE is configured to be attached to the policy map BLUE:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# all-interfaces
Router(config-af-topology)# exit
Router(config-af)# exit
Router(config)# class-map match-any DATA
Router(config-cmap)# match ip dscp 9
Router(config-cmap)# exit
Router(config)# policy-map type class-routing ipv4 unicast BLUE
Router(config-pmap)# class DATA
Router(config-pmap-c)# select-topology VOICE
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# global-address-family ipv4
Router(config-af)# service-policy type class-routing BLUE
Router(config-af)# end
```

service-policy type class-routing

To attach the service policy to the policy map for Multi-Topology Routing (MTR) traffic classification and to activate MTR, use the **service-policy type class-routing** command in global address family configuration mode. To detach the service policy from the policy map, use the **no** form of this command.

service-policy type class-routing *policy-map-name*

no service-policy type class-routing *policy-map-name*

Syntax Description

policy-map-name	Policy map name.

Command Default

The service policy is not attached.

Command Modes

Global address family configuration (config-af)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **service-policy type class-routing** command is used to attach a service policy to a policy map for MTR traffic classification. MTR traffic classification is used to configure topology-specific forwarding behaviors when multiple topologies are configured on the same router. Class-specific packets are associated with the corresponding topology table forwarding entries.

After the **service-policy type class-routing** command is entered, MTR is activated.

Examples

The following example shows how to configure traffic classification for a topology instance named VOICE:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# all-interfaces
Router(config-af-topology)# exit
Router(config-af)# exit
Router(config)# class-map match-any DATA
Router(config-cmap)# match ip dscp 9
Router(config-cmap)# exit
Router(config)# policy-map type class-routing ipv4 unicast BLUE
Router(config-pmap)# class DATA
Router(config-pmap-c)# select-topology VOICE
Router(config-pmap-c)# exit
Router(config-pmap)# exit
Router(config)# global-address-family ipv4
Router(config-af)# service-policy type class-routing BLUE
Router(config-af)# end
```

Related Commands

Command	Description
class-map	Creates a class map to match packets to a specific class of traffic.
global-address-family ipv4	Enters global address family configuration mode to configure MTR.
exit-global-af	Exits global address family configuration mode and enters global configuration mode.
policy-map type class-routing ipv4 unicast	Creates or modifies a policy map for MTR and enters policy map configuration mode.

show ip bgp topology

To display topology instance information from the Border Gateway Protocol (BGP) table, use the **show ip bgp topology** command in privileged EXEC mode.

With BGP show Command Argument

show ip bgp topology {***** | *topology*} [*bgp-keyword*]

With IP Prefix and Mask Length Syntax

show ip bgp topology {***** | *topology*} [*ip-prefix/length* [**bestpath**] [**longer-prefixes** [**injected**]] [**multipaths**] [**shorter-prefixes** [*mask-length*]] [**subnets**]]

With Network Address Syntax

show ip bgp topology {***** | *topology*} [*network-address* [*mask* | **bestpath** | **multipaths**] [**bestpath**] [**longer-prefixes** [**injected**]] [**multipaths**] [**shorter-prefixes** [*mask-length*]] [**subnets**]]

Syntax Description

*****	Displays all routing topology instances.
topology	Name of topology for which information is displayed.
bgp-keyword	(Optional) Argument representing a **show ip bgp** command keyword that can be added to this command. See Table 2.
ip-prefix/length	(Optional) The IP prefix address (in dotted decimal format) and the length of the mask (0 to 32). The slash mark must be included.
bestpath	(Optional) Displays the bestpath for the specified prefix.
longer-prefixes	(Optional) Displays the route and more specific routes.
injected	(Optional) Displays more specific routes that were injected because of the specified prefix.
multipaths	(Optional) Displays the multipaths for the specified prefix.
shorter-prefixes	(Optional) Displays the less specific routes.
mask-length	(Optional) The length of the mask as a number in the range from 0 to 32. Prefixes longer than the specified mask length are displayed.
subnets	(Optional) Displays the subnet routes for the specified prefix.
network-address	(Optional) The IP address of a network in the BGP routing table.
mask	(Optional) The mask of the network address, in dotted decimal format.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

Table 2 displays optional additional **show ip bgp** command keywords that can be configured with the **show ip bgp topology** command. Replace the *bgp-keyword* argument with the appropriate keyword from the table. For more details about each command in its **show ip bgp** *bgp-keyword* form, see the *Cisco IOS IP Routing Protocols Command Reference*, Release 12.2SR.

Table 2 Additional show ip bgp Commands and Descriptions

Command	Description
cidr-only	Display only routes with non-natural netmasks.
community	Displays routes that match a specified community.
community-list	Displays routes that match a specified community list.
dampening	Displays paths suppressed because of dampening (BGP route from peer is up and down).
extcommunity-list	Displays routes that match a specified extcommunity list.
filter-list	Displays routes that conform to the filter list.
import	Display route topology import and/or export activity.
inconsistent-as	Displays only routes that have inconsistent autonomous systems of origin.
injected-paths	Displays all injected paths.
labels	Displays labels for IPv4 NLRI specific information.
neighbors	Displays details about TCP and BGP neighbor connections.
oer-paths	Displays all OER-managed path information.
paths [*regexp*]	Displays autonomous system path information. If the optional *regexp* argument is entered, the autonomous system paths that are displayed match the autonomous system path regular expression.
peer-group	Displays information about peer groups.
pending-prefixes	Displays prefixes that are pending deletion.
prefix-list	Displays routes that match a specified prefix list.
quote-regexp	Displays routes that match the quoted autonomous system path regular expression.
regexp	Displays routes that match the autonomous system path regular expression.
replication	Displays the replication status update groups.
rib-failure	Displays bgp routes that failed to install in the routing table (RIB).
route-map	Displays routes matching the specified route map.
summary	Displays a summary of BGP neighbor status.
template	Displays peer-policy or peer-session templates.
update-group	Displays information on update groups.

Examples

The following example shows summary output for the **show ip bgp topology** command. Information is displayed about BGP neighbors configured to use the MTR topology named VIDEO.

```
Router# show ip bgp topology VIDEO summary

BGP router identifier 192.168.3.1, local AS number 45000
BGP table version is 1, main routing table version 1

Neighbor        V    AS MsgRcvd MsgSent   TblVer  InQ OutQ Up/Down  State/PfxRcd
172.16.1.2      4 45000     289     289        1    0    0 04:48:44        0
192.168.3.2     4 50000       3       3        1    0    0 00:00:27        0
```

Table 3 describes the significant fields shown in the display.

Table 3 show ip bgp topology summary Field Descriptions

Field	Description
BGP router identifier	IP address of the networking device.
local AS number	Number of the local autonomous system.
BGP table version	Internal version number of the table. This number is incremented whenever the table changes.
main routing table version	Last version of the BGP database that was injected into the main routing table.
Neighbor	IP address of a neighbor.
V	BGP version number communicated to that neighbor.
AS	Autonomous system number.
MsgRcvd	BGP messages received from that neighbor.
MsgSent	BGP messages sent to that neighbor.
TblVer	Last version of the BGP database that was sent to that neighbor.
InQ	Number of messages from that neighbor waiting to be processed.
OutQ	Number of messages waiting to be sent to that neighbor.
Up/Down	The length of time that the BGP session has been in the Established state, or the current state if it is not Established.
State/PfxRcd	Current state of the BGP session/the number of prefixes that the router has received from a neighbor or peer group. When the maximum number (as set by the **neighbor maximum-prefix** command) is reached, the string "PfxRcd" appears in the entry, the neighbor is shut down, and the connection is Idle. An (Admin) entry with Idle status indicates that the connection has been shut down using the **neighbor shutdown** command.

The following is partial output for the **show ip bgp topology** command when the **neighbors** keyword is used. Information is displayed for each neighbor that is configured to use the topology named VIDEO, and the output is similar to the output for the **show ip bgp neighbors** command with the addition of topology-related information.

```
Router# show ip bgp topology VIDEO neighbors

BGP neighbor is 172.16.1.2,  remote AS 45000, internal link
  BGP version 4, remote router ID 192.168.2.1
  BGP state = Established, up for 04:56:30
  Last read 00:00:23, last write 00:00:21, hold time is 180, keepalive interval is 60
seconds
  Neighbor sessions:
    1 active, is multisession capable
  Neighbor capabilities:
    Route refresh: advertised and received(new)
  Message statistics, state Established:
    InQ depth is 0
    OutQ depth is 0
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                0          0
    Keepalives:           296        296
    Route Refresh:          0          0
    Total:                297        297
  Default minimum time between advertisement runs is 0 seconds

 For address family: IPv4 Unicast topology VIDEO
  Session: 172.16.1.2 session 1
  BGP table version 1, neighbor version 1/0
  Output queue size : 0
  Index 1, Offset 0, Mask 0x2
  1 update-group member
  Topology identifier: 100
.
.
.
  Address tracking is enabled, the RIB does have a route to 172.16.1.2
  Address tracking requires at least a /24 route to the peer
  Connections established 1; dropped 0
  Last reset never
  Transport(tcp) path-mtu-discovery is enabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Minimum incoming TTL 0, Outgoing TTL 255
Local host: 172.16.1.1, Local port: 11113
Foreign host: 172.16.1.2, Foreign port: 179
.
.
.
BGP neighbor is 192.168.3.2,  remote AS 50000, external link
  BGP version 4, remote router ID 192.168.3.2
  BGP state = Established, up for 00:08:24
  Last read 00:00:21, last write 00:00:20, hold time is 180, keepalive interval is 60
seconds
  Neighbor sessions:
    1 active, is multisession capable
  Neighbor capabilities:
    Route refresh: advertised and received(new)
  Message statistics, state Established:
    InQ depth is 0
    OutQ depth is 0
```

```
                         Sent       Rcvd
    Opens:                  1          1
    Notifications:          0          0
    Updates:                0          0
    Keepalives:            10         10
    Route Refresh:          0          0
    Total:                 11         11
  Default minimum time between advertisement runs is 30 seconds

 For address family: IPv4 Unicast topology VIDEO
  Session: 192.168.3.2 session 1
  BGP table version 1, neighbor version 1/0
  Output queue size : 0
  Index 2, Offset 0, Mask 0x4
  2 update-group member
  Topology identifier: 100
.
.
.
  Address tracking is enabled, the RIB does have a route to 192.168.3.2
  Address tracking requires at least a /24 route to the peer
  Connections established 1; dropped 0
  Last reset never
  Transport(tcp) path-mtu-discovery is enabled
Connection state is ESTAB, I/O status: 1, unread input bytes: 0
Minimum incoming TTL 0, Outgoing TTL 1
Local host: 192.168.3.1, Local port: 11133
Foreign host: 192.168.3.2, Foreign port: 179
.
.
.
```

Table 4 describes the significant fields shown in the display.

Table 4 show ip bgp topology neighbors Field Descriptions

Field	Description
BGP neighbor	IP address of the BGP neighbor.
remote AS	Autonomous system number of the neighbor.
local AS 300 no-prepend (not shown in display)	Verifies that the local autonomous system number is not prepended to received external routes. This output supports the hiding of the local autonomous systems when migrating autonomous systems.
internal link	“internal link” is displayed for internal BGP (iBGP) neighbors. “external link” is displayed for external BGP (eBGP) neighbors.
BGP version	BGP version being used to communicate with the remote router.
remote router ID	IP address of the neighbor.
BGP state	Finite state machine (FSM) stage of session negotiation.
up for	Time, in hh:mm:ss, for which the underlying TCP connection has been in existence.
Last read	Time, in hh:mm:ss, since BGP last received a message from this neighbor.

Table 4 show ip bgp topology neighbors Field Descriptions (continued)

Field	Description
last write	Time, in hh:mm:ss, since BGP last sent a message to this neighbor.
hold time	Time, in seconds, for which BGP will maintain the session with this neighbor without receiving a messages.
keepalive interval	Time interval, in seconds, at which keepalive messages are transmitted to this neighbor.
Neighbor sessions	Number of BGP neighbor sessions configured and whether they are enabled as a single TCP session or as multiple TCP sessions.
Neighbor capabilities	BGP capabilities advertised and received from this neighbor. "advertised and received" is displayed when a capability is successfully exchanged between two routers.
Route refresh	Status of the route refresh capability.
Message statistics	Statistics organized by message type.
InQ depth	Number of messages in the input queue.
OutQ depth	Number of messages in the output queue.
Sent	Total number of transmitted messages.
Rcvd	Total number of received messages.
Opens	Number of open messages sent and received.
Notifications	Number of notification (error) messages sent and received.
Updates	Number of update messages sent and received.
Keepalives	Number of keepalive messages sent and received.
Route Refresh	Number of route refresh request messages sent and received.
Total	Total number of messages sent and received.
Default minimum time between advertisement runs	Time, in seconds, between advertisement transmissions.
For address family	Address family for which the following fields refer.
Session	IP address and number assigned to the TCP session.
BGP table version	Internal version number of the table. This is the primary routing table with which the neighbor has been updated. The number increments when the table changes.
neighbor version	Number used by the software to track prefixes that have been sent and those that need to be sent.
Topology identifier	Number that is associated with an MTR topology.
Connections established	Number of times a TCP and BGP connection has been successfully established.
dropped	Number of times that a valid session has failed or been taken down.
Last reset	Time since this peering session was last reset. The reason for the reset is displayed on this line.

Table 4 show ip bgp topology neighbors Field Descriptions (continued)

Field	Description
External BGP neighbor may be... (not shown in the display)	Indicates that the BGP TTL security check is enabled. The maximum number hops that can separate the local and remote peer is displayed on this line.
Connection state	Connection status of the BGP peer.
Minimum incoming TTL, Outgoing TTL	Number of expected incoming or outgoing TTL packets.
Local host, Local port	IP address of the local BGP speaker and BGP port number.
Foreign host, Foreign port	Neighbor address and BGP destination port number.

Related Commands

Command	Description
topology (BGP)	Configures a BGP routing process to route IP for a specified MTR topology instance.

show ip eigrp topology

To display entries in the Enhanced Interior Gateway Routing Protocol (EIGRP) topology table, use the **show ip eigrp topology** command in privileged EXEC mode.

show ip eigrp [**vrf** {*vrf-name* | *****}] [*autonomous-system-number*] **topology** [*ip-address* [*mask*]] | [**name**] [**active** | **all-links** | **detail-links** | **pending** | **summary** | **zero-successors**]

Syntax Description

vrf *vrf-name*	(Optional) Displays information about the specified VRF.
vrf *	(Optional) Displays information about all VRFs.
autonomous-system-number	(Optional) Autonomous system number.
ip-address	(Optional) IP address. When specified with a mask, a detailed description of the entry is provided.
mask	(Optional) Subnet mask. The mask is entered as a slash mark followed by the prefix length.
name	(Optional) EIGRP-IPv4 topology table name. This name is the topology identifier and shows the topology-related information for Multi-Topology Routing (MTR). **Note** Effective with Cisco IOS Release 12.2(33)SRE, this keyword was removed.
active	(Optional) Displays all topology entries that are in an active state.
all-links	(Optional) Displays all topology entries and all links (paths) instead of displaying only feasible paths.
detail-links	(Optional) Displays all topology entries with additional detail.
pending	(Optional) Displays all topology entries pending updates queued to send to neighbors.
summary	(Optional) Displays a summary of the EIGRP topology table.
zero-successors	(Optional) Displays topology entries that fail to install in the routing table due to administrative distance.

Command Default

If this command is used without any optional keywords, then only topology entries with feasible successors are displayed and only the feasible paths are shown.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.3(8)T	This command was enhanced to display internal and external EIGRP routes.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The **name** keyword was added to support MTR.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.

Release	Modification
15.0(1)M	This command was modified. The **vrf**, *vrf-name*, and * keywords and arguments were added. This command replaces the **show ip eigrp vrf topology** command.
12.2(33)SRE	This command was modified. The **vrf**, *vrf-name*, and * keywords and arguments were added. The **name** keyword was removed. This command replaces the **show ip eigrp vrf topology** command.
12.2(33)XNE	This command was integrated into Cisco IOS Release 12.2(33)XNE.
Cisco IOS XE Release 2.5	This command was integrated into Cisco IOS XE Release 2.5.

Usage Guidelines

Us the **show ip eigrp topology** command to display topology entries, feasible and non-feasible paths, metrics, and states. This command can be used without any keywords or arguments, in which case only topology entries with feasible successors are displayed, and only the feasible paths are shown. The **all-links** keyword displays all paths, whether feasible successors or not, and the **detail-links** keyword displays additional detail about these paths.

This command can be used to display information about EIGRP named configurations and EIGRP autonomous-system (AS) configurations.

This command displays the same information as the **show eigrp address-family topology** command. Cisco recommends using the **show eigrp address-family topology** command.

Examples

The following is sample output from the **show ip eigrp topology** command:

```
Router# show ip eigrp topology

EIGRP-IPv4 Topology Table for AS(1)/ID(10.0.0.1)

Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - Reply status, s - sia status
P 10.0.0.0/8, 1 successors, FD is 409600
        via 1.1.1.2 (409600/128256), Ethernet0/0
P 172.16.1.0/24, 1 successors, FD is 409600
        via 1.1.1.2 (409600/128256), Ethernet0/0
P 10.0.0.0/8, 1 successors, FD is 281600
        via Summary (281600/0), Null0
P 10.0.1.0/24, 1 successors, FD is 281600
        via Connected, Ethernet0/0
```

The following example displays detailed information for a single prefix. The prefix shown is an EIGRP internal route:

```
Router# show ip eigrp topology 10.0.0.0/8

EIGRP-IPv4 Topology Entry for AS(1)/ID(10.0.0.1) for 10.0.0.0/8
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 409600
  Descriptor Blocks:
  10.0.0.2 (Ethernet0/0), from 10.0.1.2, Send flag is 0x0
      Composite metric is (409600/128256), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 6000 microseconds
        Reliability is 255/255
        Load is 1/255
```

```
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 10.0.1.2
```

The following example displays detailed information for a single prefix. The prefix shown is an EIGRP external route:

```
Router# show ip eigrp topology 172.16.1.0/24

EIGRP-IPv4 Topology Entry for AS(1)/ID(10.0.0.1) for 10.0.0.0/8
State is Passive, Query origin flag is 1, 1 Successor(s), FD is 409600
  Descriptor Blocks:
  10.0.0.2 (Ethernet0/0), from 10.0.1.2, Send flag is 0x0
      Composite metric is (409600/128256), route is External
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 6000 microseconds
        Reliability is 255/255
        Load is 1/255
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 10.0.1.2
      External data:
        AS number of route is 0
        External protocol is Connected, external metric is 0
        Administrator tag is 0 (0x00000000)
```

The following example demonstrates the **all-links** keyword, which displays all paths, even those that are not feasible:

```
Router# show ip eigrp topology all-links

EIGRP-IPv4 Topology Table for AS(1)/ID(10.0.0.1)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 172.16.1.0/24, 1 successors, FD is 409600, serno 14
        via 10.10.1.2 (409600/128256), Ethernet0/0
        via 10.1.04.3 (2586111744/2585599744), Serial3/0, serno 18
```

The following example demonstrates the **detail-links** keyword, which displays additional detail about the routes:

```
Router# show ip eigrp topology detail-links

EIGRP-IPv4 Topology Table for AS(1)/ID(10.0.0.1)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 10.0.0.0/8, 1 successors, FD is 409600, serno 6
        via 1.1.1.2 (409600/128256), Ethernet0/0
P 172.16.1.0/24, 1 successors, FD is 409600, serno 14
        via 1.1.1.2 (409600/128256), Ethernet0/0
P 10.0.0.0/8, 1 successors, FD is 281600, serno 3
        via Summary (281600/0), Null0
P 10.1.1.0/24, 1 successors, FD is 281600, serno 1
        via Connected, Ethernet0/0
```

Table 5 describes the significant fields shown in the displays.

Table 5 show ip eigrp topology Field Descriptions

Field	Description
Codes	State of this topology table entry. Passive and Active refer to the EIGRP state with respect to this destination; Update, Query, and Reply refer to the type of packet that is being sent.
P – Passive	No EIGRP computations are being performed for this destination.
A – Active	EIGRP computations are being performed for this destination.
U – Update	Indicates that a pending update packet is waiting to be sent for this route.
Q – Query	Indicates that a pending query packet is waiting to be sent for this route.
R – Reply	Indicates that a pending reply packet is waiting to be sent for this route.
r – Reply status	Indicates that EIGRP has sent a query for the route and is waiting for a reply from the specified path.
10.16.90.0	Destination IP network number.
255.255.255.0	Destination subnet mask.
successors	Number of successors. This number corresponds to the number of next hops in the IP routing table. If “successors” is capitalized, then the route or next hop is in a transition state.
serno	Serial number.
FD	Feasible distance. The feasible distance is the best metric to reach the destination or the best metric that was known when the route went active. This value is used in the feasibility condition check. If the reported distance of the router (the metric after the slash) is less than the feasible distance, the feasibility condition is met and that path is a feasible successor. Once the software determines it has a feasible successor, it need not send a query for that destination.
via	IP address of the peer that told the software about this destination. The first *n* of these entries, where *n* is the number of successors, is the current successors. The remaining entries on the list are feasible successors.
(409600/128256)	The first number is the EIGRP metric that represents the cost to the destination. The second number is the EIGRP metric that this peer advertised.

Related Commands

Command	Description
show eigrp address-family topology	Displays entries in the EIGRP topology table.

show ip interface (MTR)

To display the usability status of interfaces configured for IP or to display IP traffic statistics for all interfaces or for a particular interface, use the **show ip interface** command in user EXEC or privileged EXEC mode.

show ip interface [*type number*] [**topology** {*name* | **all** | **base**}] [**stats**]

Syntax Description

type	(Optional) Interface type.
number	(Optional) Interface number.
topology	(Optional) Displays IP traffic statistics related to a particular topology.
name	(Optional) The topology instance.
all	(Optional) Displays statistics for all topologies.
base	(Optional) Displays base topology statistics.
stats	(Optional) Displays IP traffic statistics without topology awareness, that is, an aggregate of all topologies is displayed.

Command Default

The Cisco IOS software automatically enters a directly connected route in the routing table if the interface is usable. A usable interface is defined as one that can send and receive packets. If an interface is not usable, the directly connected routing entry is removed from the routing table. Removing the entry allows the software to use dynamic routing protocols to determine backup routes to the network, if any.

If the interface can provide two-way communication, the line protocol is marked "up." If the interface hardware is usable, the interface is marked "up."

If you specify an optional interface type and number, you see information for that specific interface.

If you specify no optional arguments, you see information on all the interfaces.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

Use the **show ip interface** command to display IP traffic statistics. When the **stats** keyword is used by itself, this command displays IP traffic statistics without topology awareness (an aggregate of all topologies). When the **topology** keyword and *name* argument are used, the statistics are limited to the IP traffic for that specific topology. The topology **base** keyword is reserved for IPv4 unicast base topology. Use the **all** keyword to display all topologies.

There are no statistics collected for the interface by default. Statistics collection for Multi-Topology Routing (MTR) is enabled by using the **ip topology-accounting** command in interface configuration mode.

Examples

The following is sample output from the **show ip interface** command:

```
Router# show ip interface FastEthernet 1/10 stats
FastEthernet1/10
    5 minutes input rate 0 bits/sec, 0 packet/sec,
    5 minutes output rate 0 bits/sec, 0 packet/sec,
    201 packets input, 16038 bytes
    588 packets output, 25976 bytes
```

Table 6 describes the significant fields shown in the display.

Table 6 show ip interface Field Descriptions

Field	Description
5 minutes input rate 0 bits/sec, 0 packets/sec,	The rate at which packets and bits are being sent into an interface.
5 minutes output rate 0/bits/sec, 0 packets/sec,	The rate at which packets and bits are being sent out of an interface.
201 packets input, 16038 bytes	The total number of packets and bytes sent into an interface.
588 packets output, 25976 bytes	The total number of packets and bytes sent out of an interface.

Related Commands

Command	Description
ip topology-accounting	Enables topology accounting for all IPv4 unicast topologies in the VRF associated with a particular interface.

show ip ospf interface

To display interface information related to Open Shortest Path First (OSPF), use the **show ip ospf interface** command in user EXEC or privileged EXEC mode.

show ip ospf [*process-id*] **interface** [*type number*] [**brief**] [**multicast**] [**topology** {*topology-name* | **base**}]

Syntax Description

process-id	(Optional) Process ID number. If this argument is included, only information for the specified routing process is included. Range is from 1 to 65535.
type	(Optional) Interface type. If the *type* argument is included, only information for the specified interface type is included.
number	(Optional) Interface number. If the *number* argument is included, only information for the specified interface number is included.
brief	(Optional) Displays brief overview information for OSPF interfaces, states, addresses and masks, and areas on the router.
multicast	(Optional) Displays multicast information.
topology *topology-name*	(Optional) Displays OSPF-related information about the named topology instance.
topology base	(Optional) Displays OSPF-related information about the base topology.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.0(25)S	The **brief** keyword was added.
12.2(15)T	The **brief** keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The **multicast**, **topology**, **base**, and *topology-name* keywords and argument were added.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRC	Support for the OSPF TTL Security Check feature was added.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.

Examples

The following is sample output from the **show ip ospf interface** command when Ethernet interface 0/0 is specified:

```
Router# show ip ospf interface ethernet 0/0
```

```
Ethernet0/0 is up, line protocol is up
  Internet Address 192.168.254.202/24, Area 0
  Process ID 1, Router ID 192.168.99.1, Network Type BROADCAST, Cost: 10
  Topology-MTID    Cost    Disabled    Shutdown      Topology Name
        0           10        no          no            Base
  Transmit Delay is 1 sec, State DR, Priority 1
  Designated Router (ID) 192.168.99.1, Interface address 192.168.254.202
  Backup Designated router (ID) 192.168.254.10, Interface address 192.168.254.10
  Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
    oob-resync timeout 40
    Hello due in 00:00:05
  Supports Link-local Signaling (LLS)
  Cisco NSF helper support enabled
  IETF NSF helper support enabled
  Index 1/1, flood queue length 0
  Next 0x0(0)/0x0(0)
  Last flood scan length is 1, maximum is 1
  Last flood scan time is 0 msec, maximum is 0 msec
  Neighbor Count is 1, Adjacent neighbor count is 1
    Adjacent with neighbor 192.168.254.10  (Backup Designated Router)
  Suppress hello for 0 neighbor(s)
```

Cisco IOS Release 12.2(33)SRB

The following sample output from the **show ip ospf interface brief topology VOICE** command shows a summary of information, including a confirmation that the Multitopology Routing (MTR) VOICE topology is configured in the interface configuration:

```
Router# show ip ospf interface brief topology VOICE

VOICE Topology (MTID 10)

Interface    PID   Area            IP Address/Mask    Cost  State Nbrs F/C
Lo0          1     0               10.0.0.2/32        1     LOOP  0/0
Se2/0        1     0               10.1.0.2/30        10    P2P   1/1
```

The following sample output from the **show ip ospf interface topology VOICE** command displays details of the MTR VOICE topology for the interface. When the command is entered without the **brief** keyword, more information is displayed.

```
Router# show ip ospf interface topology VOICE

                VOICE Topology (MTID 10)

Loopback0 is up, line protocol is up
   Internet Address 10.0.0.2/32, Area 0
   Process ID 1, Router ID 10.0.0.2, Network Type LOOPBACK
   Topology-MTID    Cost    Disabled    Shutdown      Topology Name
         10          1         no          no            VOICE
   Loopback interface is treated as a stub Host Serial2/0 is up, line protocol is up
   Internet Address 10.1.0.2/30, Area 0
   Process ID 1, Router ID 10.0.0.2, Network Type POINT_TO_POINT
   Topology-MTID    Cost    Disabled    Shutdown      Topology Name
         10          10        no          no            VOICE
   Transmit Delay is 1 sec, State POINT_TO_POINT
   Timer intervals configured, Hello 10, Dead 40, Wait 40, Retransmit 5
     oob-resync timeout 40
     Hello due in 00:00:03
   Supports Link-local Signaling (LLS)
   Cisco NSF helper support enabled
   IETF NSF helper support enabled
```

```
   Index 1/1, flood queue length 0
   Next 0x0(0)/0x0(0)
   Last flood scan length is 1, maximum is 1
   Last flood scan time is 0 msec, maximum is 0 msec
   Neighbor Count is 1, Adjacent neighbor count is 1
     Adjacent with neighbor 10.0.0.1
   Suppress hello for 0 neighbor(s)
```

Cisco IOS Release 12.2(33)SRC

The following sample output from the **show ip ospf interface** command displays details about the configured Time-to-Live (TTL) limits:

```
Router# show ip ospf interface ethernet 0
.
.
.
Strict TTL checking enabled
! or a message similar to the following is displayed
Strict TTL checking enabled, up to 4 hops allowed
.
.
.
```

Table 7 describes the significant fields shown in the displays.

Table 7 show ip ospf interface Field Descriptions

Field	Description
Ethernet	Status of the physical link and operational status of the protocol.
Process ID	OSPF process ID.
Area	OSPF area.
Cost	Administrative cost assigned to the interface.
State	Operational state of the interface.
Nbrs F/C	OSPF neighbor count.
Internet Address	Interface IP address, subnet mask, and area address.
Topology-MTID	MTR topology Multitopology Identifier (MTID). A number assigned so that the protocol can identify the topology associated with information that it sends to its peers.
Transmit Delay	Transmit delay in seconds, interface state, and router priority.
Designated Router	Designated router ID and respective interface IP address.
Backup Designated router	Backup designated router ID and respective interface IP address.
Timer intervals configured	Configuration of timer intervals.
Hello	Number of seconds until the next hello packet is sent out this interface.
Strict TTL checking enabled	Only one hop is allowed.
Strict TTL checking enabled, up to 4 hops allowed	A set number of hops has been explicitly configured.
Neighbor Count	Count of network neighbors and list of adjacent neighbors.

show ip ospf topology-info

To display Open Shortest Path First (OSPF) details about the topologies configured under the OSPF protocol instance, use the **show ip ospf topology-info** command in privileged EXEC mode.

show ip ospf [*process-id*] **topology-info** [**multicast**] [**topology** {*topology-name* | **base**}]

Syntax Description

process-id	(Optional) Process ID. If this argument is included, only information for the specified routing process is included.
multicast	(Optional) Displays information about multicast topologies.
topology *topology-name*	(Optional) Displays information about the named topology.
topology base	(Optional) Displays OSPF-related information about the base topology.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Examples

The following example shows information about an OSPF routing process under the VOICE topology:

```
Router# show ip ospf topology-info topology VOICE

            OSPF Router with ID (10.0.0.2) (Process ID 1)

                VOICE Topology (MTID 10)

  Topology priority is 120
  Number of areas transit capable is 0
  Initial SPF schedule delay 10 msecs
  Minimum hold time between two consecutive SPFs 20 msecs
  Maximum wait time between two consecutive SPFs 20000 msecs
     Area BACKBONE(0)
         SPF algorithm last executed 15:05:41.808 ago
         SPF algorithm executed 9 times
         Area ranges are
```

Table 8 describes the significant fields shown in the display.

Table 8 show ip ospf topology-info Field Descriptions

Field	Description
OSPF Router	Router ID and OSPF process ID.
VOICE Topology	Name of the OSPF topology and its MTR Topology ID (MTID).
Topology Priority	The priority that an OSPF process assigns to a topology instance for SPF calculations.
Number of areas transit capable	Number of OSPF areas that are transit-capable.

Table 8 show ip ospf topology-info Field Descriptions (continued)

Field	Description
SPF algorithm last executed	Shows the last time an SPF calculation was performed in response to topology change event records.
SPF algorithm executed	Shows the number of times an SPF calculation was performed in response to topology change event records.

show ip protocols topology

To display the configuration and state of active routing protocol processes under a topology instance, use the **show ip protocols topology** command in user EXEC or privileged EXEC mode.

show ip protocols topology *topology-name* [**summary**]

Syntax Description

topology-name	Name of the topology.
summary	(Optional) Displays summary information.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **show ip protocols topology** command is used to display general routing information and routing protocol status under a topology instance. The topology name must be specified when entering this command.

Examples

The following example shows information about an OSPF routing process under the DATA topology:

```
Router# show ip protocols topology DATA

*** IP Routing is NSF aware ***

Routing Protocol is "ospf 1"
  Outgoing update filter list for all interfaces is not set
  Incoming update filter list for all interfaces is not set
  Router ID 10.1.1.253
  It is an autonomous system boundary router
  Redistributing External Routes from,
  Number of areas in this router is 3. 3 normal 0 stub 0 nssa
  Maximum path: 4
  Routing for Networks:
  Routing Information Sources:
    Gateway         Distance      Last Update
  Distance: (default is 110)
```

Table 9 describes the significant fields shown in the display.

Table 9 show ip protocols topology Field Descriptions

Field	Description
Routing Protocol is...	Name and autonomous system or process number of currently running routing protocols.
Outgoing update filter list for all interfaces...	Indicates whether a filter for outgoing routing updates has been specified with the **distribute-list out** command.
Incoming update filter list for all interfaces...	Indicates whether a filter for incoming routing updates has been specified with the **distribute-list in** command.
Router ID	Displays the default or locally configured router ID.
Redistributing...	Indicates whether route redistribution has been enabled.
Automatic network summarization...	Indicates whether route summarization is enabled by default or with the **auto-summary** command. (Not shown in the example.)
Number of areas...	Indicates the number of locally configured areas on the router.
Maximum path	Displays the maximum number of multipaths that the routing process will support. This field displays the default or the number configured with the **maximum-paths** command.
Routing for Networks	Networks for which the routing process is currently injecting routes.
Routing Information Sources	Lists all the routing sources that the Cisco IOS software is using to build its routing table. The following is displayed for each source: • IP address • Administrative distance • Time the last update was received from this source
Distance	Number of internal and/or external distance metrics configured for the protocol.

The following example displays summary information about the topology DATA:

```
Router# show ip protocols topology DATA summary

Index Process Name
0     connected
1     static
2     ospf 1
*** IP Routing is NSF aware ***
```

Table 10 describes the significant fields shown in the display.

Table 10 show ip protocols topology summary Field Descriptions

Field	Description
Index Process Name	Displays route source type and number of associated routes.
IP Routing is NSF aware	Indicates that the Cisco IOS software image is NSF aware.

Related Commands

Command	Description
clear ip route topology	Clears entries from the routing table of a topology.
ip route topology	Configures static routing under a topology instance.
ping topology	Diagnoses basic network connectivity through a topology instance.
show ip route topology	Displays entries in a topology routing table.
show topology	Displays status and configuration information for topologies configured with MTR.

show ip route multicast

To display multicast routes in the routing table, use the **show ip route multicast** command in user EXEC or privileged EXEC mode.

show ip route multicast [**vrf** *vrf-name*] [*host-name* | *ip-address* [*mask*] [**longer-prefixes**]] [**connected** | *protocol* | **static** | **summary** | **supernets-only** | **track-table**]

Syntax Description

vrf *vrf-name*	(Optional) Specifies a VPN routing and forwarding (VRF) instance name.
hostname *ip-address*	(Optional) Host name or IP address for a specific routing table entry.
mask	(Optional) Network mask.
longer-prefixes	(Optional) Specifies that only routes that match the *hostname* and *mask* pair are displayed.
connected	(Optional) Specifies that only connected routes are displayed.
protocol	(Optional) Specifies that routes for the specified routing protocol are displayed. Enter the routing protocol as it displayed in the CLI help string.
static	(Optional) Specifies that only static routes are displayed.
summary	(Optional) Specifies that only summary routes are displayed.
supernets-only	(Optional) Specifies that only supernets are displayed.
track-table	(Optional) Displays backup static routes that are installed in the routing table via object tracking configuration.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.

Usage Guidelines

Use the **show ip route multicast** command to display multicast routes in the routing table.

Examples

The following example shows how to display a summary of multicast routes:

```
Router# show ip route multicast summary

IP routing table name is multicast (0x8000)
IP routing table maximum-paths is 32
Route Source    Networks    Subnets     Replicates  Overhead    Memory (bytes)
connected       0           0           0           0           0
static          0           0           0           0           0
internal        0                                               20
```

```
Total           0           0           0           0           20
```

Table 11 describes the significant fields shown in the display.

Table 11 show ip route multicast summary Field Descriptions

Field	Description
IP routing table name	Name of the routing table.
IP routing table maximum paths	Maximum paths displayed in the routing table.
Route source	The source of the route.
Replicates	Number of routes replicated from one topology to another.

show ip route topology

To display entries in a topology routing table, use the **show ip route topology** command in user EXEC or privileged EXEC mode.

show ip route topology *topology-name* [*hostname* | *ip-address* [*mask*] [**longer-prefixes**]] [**connected** | *protocol* | **static** | **summary** | **supernets-only** | **track-table**]

Syntax Description

topology-name	Name of a topology instance.
hostname *ip-address*	(Optional) Hostname or IP address for a specific routing table entry.
mask	(Optional) Network mask.
longer-prefixes	(Optional) Specifies that only routes that match the *ip-address* and *mask* pair are displayed.
connected	(Optional) Specifies that only connected routes are displayed.
protocol	(Optional) Routes for the specified routing protocol are displayed. Enter the routing protocol as it displayed in the CLI help string.
static	(Optional) Specifies that only static routes are displayed.
summary	(Optional) Specifies that only summary routes are displayed.
supernets-only	(Optional) Specifies that only supernets are displayed.
track-table	(Optional) Displays backup static routes that are installed in the routing table via object tracking configuration.

Command Default

No default behavior or values

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **show ip route topology** command is used to display routes installed in a topology routing table. The topology name must be specified when you enter this command.

Examples

The following example displays information for the 10.2.1.1 route under the DATA topology:

```
Router# show ip route topology DATA 10.2.1.1

Routing entry for 10.2.1.1/32
  Known via "connected", distance 0, metric 0 (connected)
  Routing Descriptor Blocks:
```

```
  * directly connected, via Ethernet1/0
      Route metric is 0, traffic share count is 1
```

Table 12 describes the significant fields shown in the display.

Table 12 show ip route topology with Address Field Descriptions

Field	Description
Routing entry for...	Network number and mask if configured.
Known via...	Indicates how the route was derived.
Routing Descriptor Blocks	Displays the next hop IP address followed by the information source.
Route metric	This value is the best metric for this routing descriptor block.
traffic share count	Number of uses for this routing descriptor block.

The following examples show the routing table of the DATA topology:

```
Router# show ip route topology DATA

Routing Table: DATA
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, + - replicated route

Gateway of last resort is not set

      10.3.0.0/8 is variably subnetted, 2 subnets, 2 masks
C        10.3.2.0/24 is directly connected, Ethernet2/0
L        10.3.2.1/32 is directly connected, Ethernet2/0
      10.0.0.0/8 is variably subnetted, 6 subnets, 2 masks
C        10.1.1.0/25 is directly connected, Ethernet0/0
L        10.1.1.1/32 is directly connected, Ethernet0/0
C        10.1.1.128/25 is directly connected, Loopback0
L        10.1.1.253/32 is directly connected, Loopback0
C        10.2.1.0/25 is directly connected, Ethernet1/0
L        10.2.1.1/32 is directly connected, Ethernet1/0
```

Table 13 describes the significant fields shown in the display.

Table 13 show ip route topology Field Descriptions

Field	Description
Routing Table	Name of the routing table.
Codes	Indicates the protocol that derived the route. The status codes are defined in the output.
10.3.2.2	Address of the remote network.
Ethernet...	Interface through which the specified network can be reached.

Table 13 show ip route topology Field Descriptions (continued)

Field	Description
via...	Specifies the address of the next router to the remote network. (Not shown in the display.)
0:01:00	Specifies the last time the route was updated (in hours:minutes:seconds). (Not shown in the display.)

Related Commands

Command	Description
clear ip route topology	Clears entries from the routing table of a topology.
ip route topology	Configures static routing under a topology instance.
ping (MTR)	Pings a destination within a specific topology.
show ip route topology	Displays the current state of a topology routing table.
show topology	Displays status and configuration information for topologies configured with MTR.

show ip static route

To display the static process local Routing Information Base (RIB) information, use the **show ip static route** command in user EXEC or privileged EXEC mode.

show ip static route [**bfd**] [**vrf** *vrf-name*] [**topology** *topology-name*] [*ip-address* [*mask*]] [**multicast**] [**summary**]

Syntax Description

bfd	(Optional) Displays IPv4 static Bidirectional Forwarding Detection (BFD) neighbor information.
vrf *vrf-name*	(Optional) Name of the VRF by which static routing information should be displayed.
topology *topology-name*	(Optional) Static route information for the specified topology.
ip-address	(Optional) Address by which static routing information should be displayed.
mask	(Optional) Subnet mask.
multicast	(Optional) Displays IPv4 multicast information.
summary	(Optional) Displays summary information.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRC	The command output was enhanced to include BFD neighbor information.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Examples

The following is sample output from the **show ip static route** command:

```
Router# show ip static route

Codes: M - Manual static, A - AAA download, N - IP NAT, D - DHCP,
       G - GPRS, V - Crypto VPN, C - CASA, P - Channel interface processor,
       B - BootP, S - Service selection gateway
       DN - Default Network, T - Tracking object
       L - TL1, E - OER
Codes in []: A - active, N - non-active, P - permanent
```

Cisco IOS Release 12.2(33)SRC

The following is sample output for the **show ip static route** command:

```
Router# show ip static route

Codes: M - Manual static, A - AAA download, N - IP NAT, D - DHCP,
       G - GPRS, V - Crypto VPN, C - CASA, P - Channel interface processor,
       B - BootP, S - Service selection gateway
       DN - Default Network, T - Tracking object
```

```
       L - TL1, E - OER
Codes in []: A - active, N - non-active, B - BFD-tracked, P - permanent

Static local RIB for default

M 10.2.2.2/32 [1/0] via Serial2/0 192.168.201.2 [N B]
M 10.0.0.0/8 [1/0] via Serial2/0 192.168.202.2 [N B]
M 10.2.0.0/8 [1/0] via Loopback0 [A]
```

Table 14 describes the significant fields shown in the display.

Table 14 show ip static route Descriptions

Field	Description
Codes	Indicates the protocol that derived the route. The status codes are defined in the output.
Static local RIB for default	Default static local RIB information.
M 10.2.2.2/32 [1/0] via Serial2/0 192.168.201.2 [N B]	Specifies the manually configured static route and the address of the next router to the remote network.

show ip static route summary

To display a global summary of the static process local Routing Information Base (RIB), use the **show ip static route summary** command in user EXEC or privileged EXEC configuration mode.

show ip static route summary

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Examples

The following example shows a global summary of the static routes:

```
Router# show ip static route summary

Allow inter-vrf: yes
Number of download routes: 0
Number of static routes: 20
Number of per user routes: 5
Download route version: 0
```

Table 15 describes the significant fields shown in the display.

Table 15 show ip static route summary Descriptions

Field	Description
Allow inter-vrf:	Routes across VRFs or confined to separate VRFs.
Number of download routes:	Number of routes downloaded.
Number of static routes:	The total number of static routes.
Number of per user routes:	The total number of routes per static route owner.
Download route version:	Version of the downloaded route.

show ip traffic (MTR)

To display statistics about IP traffic, use the **show ip traffic** command in privileged EXEC mode.

show ip traffic [**topology** {*name* | **all** | **base**}]

Syntax Description

topology	(Optional) Displays IP traffic statistics for a particular topology.
name	(Optional) Topology name.
all	(Optional) Displays statistics for all topologies.
base	(Optional) Displays base topology statistics.

Command Default

Statistics for all topologies are displayed.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

Use the **show ip traffic** command to display global IP traffic statistics (an aggregation of all the topologies when Multi-Topology Routing [MTR] is enabled) or statistics related to a particular topology. The **base** keyword is reserved for the IPv4 unicast base topology. The **all** keyword displays all topologies.

Examples

The following is sample output from the **show ip traffic** command for the VOICE topology:

```
Router# show ip traffic topology VOICE

  Topology: VOICE
  5 minute input rate 0 bits/sec, 0 packet/sec,
  5 minute output rate 0 bits/sec, 0 packet/sec,
  100 packets input, 6038 bytes,
  88 packets output, 5976 bytes.
```

Table 16 describes the significant fields shown in the display.

Table 16 show ip traffic Field Descriptions

Field	Description
5 minute input rate 0 bits/sec, 0 packets/sec,	The rate at which the system is processing incoming IP packets for the VOICE topology.
5 minute output rate 0/bits/sec, 0 packets/sec,	The rate at which the system is processing outgoing IP packets for the VOICE topology.
100 packets input, 6038 bytes	The total number of incoming packets and bytes processed for the VOICE topology.
88 packets output, 5976 bytes	The total number of outgoing packets and bytes processed for the VOICE topology.

show isis neighbors

To display information about Intermediate System-to-Intermediate System (IS-IS) neighbors, use the **show isis neighbors** command in privileged EXEC mode.

show isis neighbors [**detail**]

Syntax Description

detail	(Optional) Displays more detailed information for IS-IS neighbors.

Command Default

Brief information for IS-IS neighbors is displayed.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(18)S	This command was introduced.
12.3	This command was integrated into Cisco IOS Release 12.3.
12.0(29)S	This command was integrated into Cisco IOS Release 12.0(29)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The command output was modified to support the Multi-Topology Routing (MTR) feature.
12.2SX	This command is supported in the Cisco IOS Release 12.2SX train. Support in a specific 12.2SX release of this train depends on your feature set, platform, and platform hardware.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **show isis neighbors** command is used to display brief information about connected IS-IS routers. Enter the **detail** keyword to display more detailed information.

Examples

Release 12.0(29)S

The **show isis neighbors** command is entered to display information about the IS-IS neighbor Router1.

```
Router5# show isis neighbors

System Id      Type Interface IP Address      State Holdtime Circuit Id
0000.0000.0002 L1   Et0/0     192.168.128.2   UP    21       R5.02
0000.0000.0002 L2   Et0/0     192.168.128.2   UP    28       R5.02
```

Thee **show isis neighbors detail** command is entered to display more detailed information about the IS-IS neighbor Router1.

```
Router5# show isis neighbors detail
```

```
System Id           Type Interface IP Address      State Holdtime Circuit Id
0000.0000.0002      L1   Et0/0     192.168.128.2   UP    21       R5.02
  Area Address(es): 49.0001
  SNPA: aabb.cc00.1f00
  State Changed: 00:00:52
  LAN Priority: 64
  Format: Phase V
0000.0000.0002      L2   Et0/0     192.168.128.2   UP    22       R5.02
  Area Address(es): 49.0001
  SNPA: aabb.cc00.1f00
  State Changed: 00:00:52
  LAN Priority: 64
  Format: Phase V
```

Release 12.2(33)SRB

The **show isis neighbors detail** command is entered to verify the status of the IS-IS neighbor Router1 for a network that has MTR configured. For each of the topologies - unicast, DATA and VOICE, the interface information is displayed.

```
Router5# show isis neighbors detail

System Id      Type Interface IP Address      State Holdtime Circuit Id
0000.0000.0005 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
```

Table 17 describes the significant fields shown in the display.

Table 17 show isis neighbors Field Descriptions

Field	Description
System Id	Six-byte value that identifies a system in an area.
Type	Level type. Indicates whether the IS-IS neighbor is a Level 1, Level-1-2, or Level 2 router.
Interface	Interface from which the system was learned.
IP Address	IP address of the neighbor router.
State	Indicates whether the state of the IS-IS neighbor is up or down.
Holdtime	Link-state packet (LSP) holdtime. Amount of time that the LSP remains valid (in seconds).
Circuit Id	Port location for the IS-IS neighbor router that indicates how it is connected to the local router.
Area Address(es)	Reachable area addresses from the router. For Level 1 LSPs, these are the area addresses configured manually on the originating router. For Level 2 LSPs, these are all the area addresses for the area to which this router belongs.
SNPA	Subnetwork point of attachment. This is the data-link address.
State Changed	State change.
LAN Priority	Priority of the LAN.

Table 17 show isis neighbors Field Descriptions (continued)

Field	Description
Remote TID	Neighbor router topology ID(s).
Local TID	Local router topology ID(s).

show mtm table

To display information about the classifier values and the DiffServ Code Point (DSCP) values assigned to each topology, use the **show mtm table** command in user EXEC or privileged EXEC mode.

show mtm table

Syntax Description

This command has no arguments or keywords.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **show mtm table** command shows the DSCP bits and classifier values that are mapped to the topologies for Multi-Topology Routing (MTR). The DSCP bits are used to mark the packet and assign traffic to a topology.

Examples

The following example displays the classifier and DSCP values for the VOICE and VIDEO topologies:

```
Router# show mtm table

MTM Table for VRF: default, ID:0

Topology                Address Family   Associated VRF         Topo-ID

base                    ipv4              default                 0

VOICE                   ipv4              default                 2051
Classifier: ClassID:3
DSCP: cs1
DSCP: 9

VIDEO                   ipv4              default                 2054
Classifier: ClassID:4
DSCP: af11
```

Table 18 describes the significant fields shown in the display.

Table 18 show mtm table Field Descriptions

Field	Description
MTM table	Displays the MTR translation manager table.
Topology	Name of the topology.

Table 18 show mtm table Field Descriptions (continued)

Field	Description
Classifier: ClassID:	Displays the class identifier.
DSCP:	DSCP code used to mark the packet. A subset of DSCP bits is used to encode classification values in the IP packet header.
Topo-ID	Topology identifier (TID). Each topology is configured with a unique TID.

show policy-map type class-routing ipv4 unicast

To display class-routing policy map information for Multi-Topology Routing (MTR), use the **show policy-map type class-routing ipv4 unicast** command in privileged EXEC mode.

show policy-map type class-routing ipv4 unicast [**interface** [*interface-type interface-number*]]

Syntax Description

interface	(Optional) Displays statistics on all interfaces under the global space.
interface-type interface-number	(Optional) Displays statistics on a specific interface.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Examples

The following example shows that the policy map MTR is attached to the voice and video topologies:

```
Router# show policy-map type class-routing ipv4 unicast

Policy Map type class-routing ipv4 unicast MTR
    Class VOICE-CLASS
      select-topology voice
    Class VIDEO-CLASS
      select-topology video
```

The following example shows statistics about the policy map named MTR and the voice and video topologies. The number of packets and total bytes on a per-class and per-interface basis are shown. There is also further granularity in the display output by showing per match statement statistics:

```
Router# show policy-map type class-routing ipv4 unicast interface ethernet 0/0

  Service-policy: MTR

    Class-map: VOICE-CLASS (match-any)
      10 packets, 600 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match:  dscp cs1 (8)
        10 packets, 600 bytes
        5 minute rate 0 bps
      select-topology voice

    Class-map: VIDEO-CLASS (match-any)
      15 packets, 900 bytes
      5 minute offered rate 0 bps, drop rate 0 bps
      Match:  dscp af43
        15 packets, 900 bytes
        5 minute rate 0 bps
      select-topology video
```

Table 19 describes the significant fields shown in the display.

Table 19 show policy-map type class-routing ipv4 unicast Field Descriptions

Field	Description
Service-policy:	Name of the service policy.
Class	Name of the class.
Class-map:	Class map to be used for matching packets to a specified class. Match any is the required behavior for MTR.
10 packets, 600 bytes	Number of packets and bytes per class and interface.
Match:	Identifies the DSCP value as a match criteria. Statistics are further refined to show statistics for packets with the specified DSCP value in the IP header.
select-topology	Name of the topology.

show snmp context mapping

To display information about Simple Network Management Protocol (SNMP) context mappings for Multi-Topology Routing (MTR), use the **show snmp context mapping** command in privileged EXEC mode.

show snmp context mapping

Syntax Description

This command has no arguments or keywords.

Command Default

No default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The SNMP agent software component on the router can be configured to pass a context string to existing MIB access functions by using the **snmp context** command. Network management applications can provide these context strings in SNMP transactions to direct those transactions to a specific virtual private network (VPN) routing and forwarding (VRF) instance, a specific topology, and/or routing protocol instance. The **show snmp context mapping** command displays information about the mapping of the context to the VRF, address family, topology, and protocol.

Examples

The following example displays the mapping of the context to the topology and protocol instance:

```
Router# show snmp context mapping

Context: ospf-voice
  VRF Name:
  Address Family Name: ipv4
  Topology Name: voice
  Protocol Instance: OSPF-3 Router

Context: context-ospf
  VRF Name:
  Address Family Name:
  Topology Name:
  Protocol Instance: OSPF-3 Router

Context: context-vrfA
  VRF Name: vrfA
  Address Family Name:
  Topology Name:
  Protocol Instance:

Context: context-voice
```

```
VRF Name:
Address Family Name: ipv4
Topology Name: voice
Protocol Instance:
```

Table 20 describes the significant fields shown in the display.

Table 20 show snmp context mapping Field Descriptions

Field	Description
Context:	The context string that is associated with the VRF, data topology, or protocol instance.
VRF Name:	VRF name.
Address Family Name:	Address family name. Currently, only the IPv4 address family (multicast and unicast) is supported.
Topology Name:	Name of the topology.
Protocol Instance:	Routing protocol that is associated with the context string.

Related Commands

Command	Description
snmp context	Creates an SNMP context for MTR.

show topology

To display status and configuration information for topologies configured with Multi-Topology Routing (MTR), use the **show topology** command in privileged EXEC mode.

show topology [**cache** [*topology-id*] | **ha** | [**detail** | **interface** | **lock** | **router**] [**all** | **ipv4** | **ipv6** | **vrf** *vpn-instance*]]}

Syntax Description

cache	(Optional) Displays cache topology information.
topology-id	(Optional) A topology ID in hexadecimal format.
ha	(Optional) Displays routing table high availability information.
detail	(Optional) Displays detailed routing topology instance information.
interface	(Optional) Displays the status of interfaces that are associated with a topology.
lock	(Optional) Displays topology lock information.
router	(Optional) Displays the status of topologies on a router.
all	(Optional) Displays all topologies.
ipv4	(Optional) Displays IPv4 topologies.
ipv6	(Optional) Displays IPv6 topologies.
vrf *vpn-instance*	(Optional) Displays topologies associated with a VPN.

Command Default

Information about all topologies is displayed.

Command Modes

Privileged EXEC (#)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **show topology** command is used to display configuration information for MTR. The output displays global mode, interface mode, and router mode configurations. The output can be filtered to display information for only specific address families and subaddress families or specific topologies.

Examples

The following example shows the topology name and status of base and class-specific topologies:

```
Router# show topology

Topology                Address Family  Associated VRF  State
base                    ipv4            default         UP

VOICE                   ipv4            default         UP

base                                    default         UP
```

Table 21 describes the significant fields shown in the display.

Table 21 show topology Field Descriptions

Field	Description
Topology:	The topology name. This field will display base and class-specific topologies.
Address family	The address family and subaddress family.
Associated VRF	The VPN or VRF name is displayed if configured. VRF instances are shown as separate base topologies. The word “default” is displayed if no VRF is configured.
State	Status of the topology. The state will be displayed as UP or DOWN.

The following example shows detailed information about base and class-specific topologies:

```
Router# show topology detail

Topology: base
   Address-family: ipv4
   Associated VPN VRF is default
   Topology state is UP
   Associated interfaces:
     Ethernet0/0, operation state: UP
     Ethernet1/0, operation state: DOWN
     Serial2/0, operation state: DOWN
     Serial3/0, operation state: UP

Topology: VOICE
   Address-family: ipv4
   Associated VPN VRF is default
   Topology state is UP
   Associated interfaces:
     Ethernet0/0, operation state: UP

Topology: base
   Address-family:
   Associated VPN VRF is default
   Topology state is UP
   Route Replication Enabled:
     from unicast all
   Associated interfaces:
     Ethernet0/0, operation state: UP
```

Table 22 describes the significant fields shown in the display.

Table 22 show topology detail Field Descriptions

Field	Description
Topology	The topology name. This field will display base and class-specific topologies.
Address-family	The address family and subaddress family.
Associated VPN VRF is	The VPN or VRF name is displayed if configured. VRF instances are shown as separate base topologies. The word “default” is displayed if no VRF is configured.

Table 22 show topology detail Field Descriptions

Field	Description
Topology state is	Status of the topology. The state will be displayed as UP or DOWN.
Topology fallback is enabled (not shown)	This field is displayed when incremental forwarding mode is enabled when the **forward-base** command is configured under the global topology configuration.
Topology is enabled on all interfaces (not shown)	This field is displayed when a topology is configured to use all interfaces when the **all-interfaces** command is configured under the global topology configuration.
Route Replication Enabled:	This field is displayed when route replication is configured to be enabled.
Associated interfaces:	Lists all interfaces that are associated with a given topology. The list displays interfaces that are configured globally or individually.
operation state:	Status of the operation. The state will be displayed as UP or DOWN.

The following example shows information about the status of topologies on a route. The additional fields here show which IP routing protocols are configured for each topology.

```
Router# show topology router

Topology: base
   Address-family: ipv4
   Associated VPN VRF is default
   OSPF 2 Area 0
   IS-IS [name] Level-1

Topology: VOICE
   Address-family: ipv4
   Associated VPN VRF is default
   OSPF 2 Area 0
   IS-IS [name] Level-1

Topology: base
   Address-family: IPv4 multicast
   Associated VPN VRF is default
   OSPF 2 Area 0
   IS-IS [name] Level-1
```

The following example shows information about the status of each interface that is associated with a topology:

```
Router# show topology interface

Topology: base
   Address-family: ipv4
   Associated VPN VRF is default
   Topology state is UP
   Associated interfaces:
     Ethernet0/0, operation state: UP
      OSPF 2 metric: 10 state: UP
      IS-IS [name] metric (10,10) state: UP

Topology: VOICE
```

```
   Address-family: ipv4
   Associated VPN VRF is default
   Topology state is UP
   Associated interfaces:
     Ethernet0/0, operation state: UP
      OSPF 2 metric: 10 state: UP
      IS-IS [name] metric (10,10) state: UP

Topology: base
   Address-family: IPv4 multicast
   Associated VPN VRF is default
   Topology state is UP
   Associated interfaces:
     Ethernet0/0, operation state: UP
      OSPF 2 metric: 10 state: UP
      IS-IS [name] metric (10,10) state: UP
```

Related Commands

Command	Description
clear ip route topology	Clears entries from the routing table of a topology.
ip route topology	Configures static routing under a topology instance.
ping topology	Diagnoses basic network connectivity through a topology instance.
show ip protocols topology	Displays the configuration and state of active routing protocol processes under a topology instance.
show ip route topology	Displays the current state of a topology routing table.

shutdown (MTR)

To temporarily disable a topology instance without removing the topology configuration, use the **shutdown** command in address family topology configuration mode. To restart the topology instance, use the **no** form of this command.

shutdown

no shutdown

Syntax Description

This command has no arguments or keywords.

Command Default

The default state is enabled.

Command Modes

Address family topology configuration (config-af-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **shutdown** (MTR) command is used to temporarily disable a topology without removing the topology configuration from the router. This command is useful for initial topology configuration. The topology can be placed in a shutdown state until the configuration is complete and the topology is ready to be deployed.

A topology is operationally disabled when it is shut down. No routing or forwarding occurs, and routing and forwarding tables are either empty or nonexistent when a topology is in a shutdown state.

Note A topology cannot be placed in the shutdown state if referenced by any active policy map.

Examples

The following example configures the router to temporarily place the VOICE topology in a shutdown state:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# all-interfaces
Router(config-af-topology)# forward-base
Router(config-af-topology)# shutdown
Router(config-af-topology)# end
```

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a router.
exit-topo	Exits address family topology configuration mode, and enters global address family configuration mode.
forward-base	Configures the forwarding mode under a topology instance.
maximum routes (MTR)	Sets the maximum number of routes that a topology instance will accept and install into the RIB.
topology (global)	Configures a topology instance.

snmp context

To create a Simple Network Management Protocol (SNMP) context for Multi-Topology Routing (MTR) or for virtual networking, use the **snmp context** command in the appropriate command mode. To delete an SNMP context, use the **no** form of this command.

For SNMP V1 or V2c

snmp context *context-name* [**community** *community-name* [**ro** | **rw**]]

For SNMP V3

snmp context *context-name* [**user** *username* [**credential** | [**encrypted**] [**auth** {**md5** *password* | **sha** *password*}] [**access** {*access-list-number*| *access-list-name* | **ipv6** *access-list-name*}]]]

no snmp context *context-name*

Syntax Description

context-name	Name of the SNMP context being created.
community *community-name*	(Optional) In SNMP v2c, specifies an SNMP community string.
ro	(Optional) In SNMP v2c, specifies read-only access.
rw	(Optional) In SNMP v2c, specifies read and write access.
user *username*	(Optional) In SNMP v3, specifies an SNMP user.
credential	(Optional) In SNMP v3, specifies if the user password is already configured and saved.
encrypted	(Optional) In SNMP v3, specifies that passwords are MD5 or SHA digests.
auth	(Optional) In SNMP v3, specifies authentication parameters for the user.
md5 *password*	(Optional) In SNMP v3, uses HMAC MD5 algorithm for authentication.
sha *password*	(Optional) In SNMP v3, uses HMAC SHA algorithm for authentication.
access	(Optional) In SNMP v3, specifies an access list associated with this group.
access-list-number	(Optional) In SNMP v3, specifies a standard access list number in the range 1 to 99.
access-list-name	(Optional) In SNMP v3, specifies an access list name.
ipv6 *access-list-name*	(Optional) In SNMP v3, specifies an IPv6 access list name.

Command Default

No SNMP contexts are configured.

Command Modes

Address family configuration (config-router-af)
Router address family topology configuration (config-router-af-topology)
Router configuration (config-router)
VRF address family configuration (config-vrf-af)
VRF configuration (config-vrf)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
Cisco IOS XE Release 3.1S	This command integrated into Cisco IOS XE Release 3.1S.
Cisco IOS XE Release 3.2S	This command was modified. All of the keywords were added, and all of the arguments except for *context-name* were added.

Usage Guidelines

When you use the **no snmp context** command, all SNMP instances in that context are deleted.

Examples

The following example shows how to create an SNMP context to be associated with VPN companyA:

```
Router(config)# ip vrf companyA
Router(config-vrf)# snmp context contextA
```

The following example shows how to create an SNMP context in VRF address family configuration mode to be associated with VPN companyA:

```
Router(config)# vrf definition companyA
Router(config-vrf)# address-family ipv4
Router(config-vrf-af)# snmp context contextA
```

Related Commands

Command	Description
address-family (VRF)	Selects an address family type for a VRF table and enters VRF address family configuration mode.
ip vrf	Configures a VRF routing table.
show snmp context mapping	Displays information about SNMP context mappings for MTR.
vrf definition	Configures a VRF routing table instance and enters VRF configuration mode.

topology (BGP)

To configure a Border Gateway Protocol (BGP) routing process to route IP traffic for the specified topology instance and to enter router scope address family topology configuration mode, use the **topology** command in router scope address family configuration mode. To disassociate the BGP routing process from the topology instance, use the **no** form of this command.

topology {*topology-name* | **base**}

no topology {*topology-name* | **base**}

Syntax Description

topology-name	Name of a class-specific topology. The *topology-name* argument is case-sensitive.
base	Specifies the base topology.

Command Default

No default behavior or values

Command Modes

Router scope address family configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **topology** (BGP) command is used in a Multi-Topology Routing (MTR) configuration to enable a specific topology inside a BGP address family session. Command configurations after the **topology** command is entered apply only to the topology instance. The topology must first be defined globally using the **global-address-family** command in global configuration mode before the topology can be configured under the BGP routing session. The **topology** (BGP) command is entered under a BGP router scope hierarchy that includes an address family configuration.

Examples

The following example configures a BGP peering session with the 192.168.3.2 neighbor under the VOICE topology:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# all-interfaces
Router(config-af-topology)# exit
Router(config-af)# exit
Router(config)# router bgp 45000
Router(config-router)# scope global
Router(config-router-scope)# bgp default ipv4-unicast
Router(config-router-scope)# neighbor 192.168.3.2 remote-as 50000
Router(config-router-scope)# address-family ipv4 unicast
Router(config-router-scope-af)# topology VOICE
Router(config-router-scope-af-topo)# bgp tid 100
Router(config-router-scope-af-topo)# neighbor 192.168.3.2 activate
Router(config-router-scope-af-topo)# end
```

Related Commands

Command	Description
bgp tid	Configures BGP to accept routes with a specified topology ID.
global-address-family	Configures the BGP to accept routes with a specified topology ID.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.
show ip bgp topology	Displays topology instance information from the BGP table.

topology (EIGRP)

To configure an Enhanced Interior Gateway Routing Protocol (EIGRP) process to route IP traffic under the specified topology instance and to enter address-family topology configuration mode, use the **topology** command in address-family configuration mode. To disassociate the EIGRP routing process from the topology instance, use the **no** form of this command.

topology {**base** | *topology-name* **tid** *number*}

no topology *topology-name*

Syntax Description

base	Specifies the base topology.
topology-name	Topology name. The *topology-name* argument is case-sensitive.
tid *number*	Specifies the topology ID number. The value for this argument can be a number from 1 to 65535.

Command Default

EIGRP routing processes are not configured to route IP traffic under a topology instance.

Command Modes

Address-family configuration (config-router-af)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.
12.2(33)XNE	This command was integrated into Cisco IOS Release 12.2(33)XNE.
Cisco IOS XE Release 2.5	This command was integrated into Cisco IOS XE Release 2.5.

Usage Guidelines

The **topology** command is used in a Multi-Topology Routing (MTR) configuration to enable an EIGRP process under the specified topology. The **topology** command is entered under address-family configuration mode. Command configurations are applied only to the topology instance. The topology must be defined globally with the **global-address-family** command in global address-family configuration mode before the topology can be configured under the EIGRP process.

The **tid** keyword associates an ID with the topology instance. Each topology must be configured with a unique topology ID. The topology ID is used to identify and group Network Layer Reachability Information (NLRI) for each topology in EIGRP updates.

The topology ID must be consistent across routers so that EIGRP can correctly associate topologies.

Examples

The following example configures EIGRP process 1 to route traffic for the 192.168.0.0/16 network under the VOICE topology instance:

```
Router(config)# router eigrp 1
Router(config-router)# address-family ipv4 unicast autonomous-system 3
```

```
Router(config-router-af)# topology VOICE tid 100
Router(config-router-af-topology)# no auto-summary
Router(config-router-af-topology)# network 192.168.0.0 0.0.255.255
Router(config-router-af-topology)# end
```

Related Commands

Command	Description
clear ip eigrp	Resets EIGRP process and neighbor session information.
global-address-family ipv4	Enters global address family configuration mode to configure MTR.
topology (interface)	Configures an MTR topology instance on an interface.

topology (global)

To configure a global topology instance and enter routing topology configuration mode, use the **topology** command in global address family configuration mode. To disable the topology instance and remove from the router configuration, use the **no** form of this command.

topology {**base** | *topology-name*}

no topology {**base** | *topology-name*}

Syntax Description

base	Configures the topology instance to import the base topology. This keyword can only be accepted in IPv4 multicast families.
topology-name	Name of the topology instance. The *topology-name* argument is case-sensitive; VOICE and voice specify different topologies.

Command Default

No global topology instances are configured.

Command Modes

Global address family configuration (config-af)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **topology** (global) command is used to configure a topology instance and enter routing topology configuration mode. Up to 32 unicast and a single multicast topology can be configured on a router. In routing topology configuration mode, the following global topology configuration parameters are applied:

- Global interface configuration—The topology is configured on all interfaces by entering the **all-interfaces** command. All interfaces are removed from the topology by entering the **no** form of this command, which is the default.
- Forwarding mode—The method that the router uses to look up forwarding entries in the FIB is configured by entering the **forward-base** command. Entering this command enables “incremental” forwarding mode. Entering the **no** form enables “strict” forwarding mode, which is the default. In strict mode, the router will look for a forwarding entry only within the class-specific topology FIB. If an entry is not found, the packet is dropped. In incremental mode, the router will first look in the class-specific topology FIB. If a covering forwarding entry is not found, the router will then look in the base topology FIB.
- Maximum route limit—A limit for the number of routes that will be permitted in the topology and installed to the topology RIB is configured by entering the **maximum routes** (MTR) command. This functionality is similar to routing and VPN maximum route features. No limit is the default.

Note Per-interface topology configuration parameters override configurations applied in global address family topology configuration and routing topology configuration mode.

Examples

The following example creates a topology instance named VOICE. The router is configured to use incremental forwarding mode and to generate warning messages when 1000 routes have been accepted/installed in the VOICE topology RIB:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology VOICE
Router(config-af-topology)# forward-base
Router(config-af-topology)# maximum routes 1000 warn-only
```

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a router.
exit-topo	Exits address family topology mode and enters global address family configuration mode.
forward-base	Configures the forwarding mode under a topology instance.
global-address-family	Enters global address family configuration mode to configure MTR.
maximum routes (MTR)	Sets the maximum number of routes that a topology instance will accept and install into the RIB.
shutdown	Temporarily disables a topology instance without removing the topology configuration.
topology (interface)	Configures an MTR topology instance on an interface.

topology (interface)

To configure a Multi-Topology routing (MTR) topology instance on an interface, use the **topology** command in interface configuration mode. To disable the topology interface configuration and configure the router to use global defaults, use the **no** form of this command.

topology ipv4 [**multicast** | **unicast**] {*topology-name* [**disable**] | **base**}

no topology ipv4 [**multicast** | **unicast**] {*topology-name* [**disable**] | **base**}

Syntax Description

ipv4	Specifies the IPv4 address family.
multicast	(Optional) Specifies the multicast subaddress family.
unicast	(Optional) Specifies the unicast address family.
topology-name	Specifies the name of the topology instance.
disable	(Optional) Disables the specified topology instance on the interface. Entering the **no** form of this command with this keyword enables the interface.
base	Specifies the base topology.

Command Default

Unicast subaddress family configuration mode is entered when no subaddress family is specified.

No interfaces are included in class-specific topologies unless explicitly configured.

Configuration applied with the **all-interfaces** command in routing topology configuration does not override individual interface configuration applied in interface topology configuration mode.

Command Modes

Interface configuration (config-if)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **topology** command is used to apply specific topology configuration at the interface level. The address family must be specified when this command is entered. The subaddress family can be optionally specified. Entering this command in Interface configuration mode places the router in interface topology configuration mode. In this mode, Enhanced Interior Gateway Routing Protocol (EIGRP), Intermediate System-to-Intermediate System, and Open Shortest Path First (OSPF) interface-specific configuration can be applied.

Disabling a Topology Under an Interface

An interface topology configuration can be disabled or an interface can be excluded from global topology configuration by entering this command with the **disable** keyword. Entering the **disable** keyword for a base topology removes only specific base topology configuration that applies to a class-specific topology.

Examples

The following example applies an OSPF cost of 10 to routes learned through the topology VOICE. This configuration also disables the multicast topology VIDEO.

```
Router(config)# interface Ethernet 0/0
Router(config-if)# topology ipv4 VOICE
Router(config-if-topology)# ip ospf cost 10
Router(config-if-topology)# exit
Router(config-if)# topology ipv4 multicast VIDEO disable
Router (config-if)# end
```

Related Commands

Command	Description
exit-if-topology	Exits interface topology configuration mode.
ip ospf cost (MTR)	Configures the OSPF interface cost under a topology instance.
ip ospf topology disable	Disables an OSPF process under a topology interface configuration.

topology (IS-IS)

To configure Intermediate System-to-Intermediate System (IS-IS) Multi-Topology Routing (MTR) support for a non-base topology or to enter a configuration sub-mode specific to an IPv4 multicast base topology, use the **topology** command in router address family configuration mode.

MTR Unicast for IPv4 or IPv6

topology *topology-name* **tid** *number*

MTR Multicast for IPv4

topology base

Syntax Description

base	(Required) Specifies the base topology and enters a configuration sub-mode specific to the IPv4 multicast base topology. The **base** keyword is available only for MTR multicast for IPv4.
topology-name	(Required) Specifies the topology name. The *topology-name* argument is case-sensitive. The *topology-name* argument is available only for MTR unicast for IPv4 and Ipv6.
tid *number*	(Required) Specifies the topology ID number. The value for this argument can be a number from 1 to 65535. The **tid** keyword and *number* argument are available only for MTR unicast for IPv4 and IPv6.

Command Default

No default behavior or values

Command Modes

Router address family configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

The **topology** command is used in an MT configuration to enable an IS-IS instance under the base topology for IPv4 multicast, or to configure IS-IS support for a non-base topology. The **topology** command is entered under an address family configuration. Command configurations are applied to only the topology instance. The topology must be defined globally with the **global-address-family** command in global configuration mode before the topology can be configured under the IS-IS instance.

The **tid** keyword associates an ID with the topology instance. Each topology must be configured with a unique topology ID. The topology ID is used to identify and group Network Layer Reachability Information (NLRI) for each topology in IS-IS updates.

Examples

The following example configures the IS-IS DATA topology with a TID value of 200 for IPv4 unicast:

```
router isis
 net 33.3333.3333.3333.00
 metric-style wide
 address-family ipv4 unicast
  topology DATA tid 200
  end
```

The **topology** command is entered with the **base** keyword to specify the base topology for IPv4 multicast base topology:

```
router isis
 net 33.3333.3333.3333.00
 metric-style wide
 address-family ipv4 multicast
  topology base
```

Related Commands

Command	Description
address-family (IS-IS)	Configures the exchange of address family and subaddress family prefixes.
topology (interface)	Configures an MTR topology instance on an interface.

topology (OSPF)

To configure an Open Shortest Path First (OSPF) process to route IP traffic under the specified topology instance, use the **topology** command in address family configuration mode. To remove the OSPF routing process from the topology instance, use the **no** form of this command.

topology {**base** | *topology-name* **tid** *number*}

no topology {**base** | *topology-name* **tid** *number*}

Syntax Description

base	Specifies the base topology.
topology-name	Specifies the topology name. The *topology-name* argument is case-sensitive; VOICE and voice specify different topologies.
tid *number*	Specifies a topology ID number. The value that can be entered for this argument is a number from 5 to 4095. **Note** The topology ID must be entered during initial configuration. This keyword and argument is optional for subsequent configuration of the same topology instance.

Command Default

OSPF assigns the ID number 0 to the base unicast topology and the number 1 to the base multicast topology.

Command Modes

Address family configuration

Command History

Release	Modification
12.2(33)SRB	This command was introduced.

Usage Guidelines

The **topology** command is used in Multi-Topology Routing (MTR) configuration to enable an OSPF process under the specified topology. The **topology** command is entered under router address family configuration. Entering the **topology** command places the router in router address family topology configuration mode. Subsequent commands that are configured are applied to only the specified topology instance. The topology must be defined globally with the **global-address-family** command in global configuration mode before the topology can be configured under the OSPF process.

Multicast Base Topology

The **base** keyword is used to enter the base topology when a multicast subaddress family configuration is created. Entering the **no** form of this command for a multicast configuration does not remove the base topology, only the command configurations that were entered in this mode.

Note The base keyword is accepted for only IPv4 multicast. The **tid** keyword is accepted for only IPv4 and IPv6 unicast.

Topology ID

The topology ID must be specified with the **tid** keyword when this command is first entered. This keyword is optional for subsequent configuration. The topology ID cannot be changed after a topology instance is configured. You must first remove the topology instance from the router configuration and then reconfigure the topology instance with a new topology ID.

Examples

The following example creates the VOICE topology instance and configures the topology ID 100:

```
Router(config)# router ospf 1
Router(config-router)# address-family ipv4
Router(config-router-af)# topology VOICE tid 100
Router(config-router-af-topology)# end
```

Related Commands

Command	Description
address-family (OSPF)	Configures address family and subaddress family IP prefix exchange.

topology-accounting

To enable topology accounting on all of the interfaces in the global address family for the default VRF instance, use the **topology-accounting** command in global address family configuration mode. To disable statistics collection from all interfaces that are part of default VRF, use the **no** form of this command.

topology-accounting

no topology-accounting

Syntax Description

This command has no arguments or keywords.

Command Default

No topology accounting statistics are collected.

Command Modes

Global address family configuration (config-af)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.

Usage Guidelines

Use this command to enable topology accounting on all of the interfaces in the global address family for all IPv4 unicast topologies in the default VRF instance. Enabling this command does not impact interfaces in other VRF instances. Statistic collection is enabled and information is collected and accumulated from interfaces that belong in the default VRF and are participating in one or more IPv4 topologies.

The **no** form of this command disables statistics collection from all interfaces that are part of the default VRF instance. The **no** form of this command does not disable statistics collection from interfaces on which the **ip topology-accounting** command has been configured.

Examples

The following example shows how to enable topology accounting on all interfaces in the global address family for all IPv4 unicast topologies in the default VRF instance:

```
Router(config)# global-address-family ipv4
Router(config-af)# topology-accounting
```

Related Commands

Command	Description
ip topology-accounting	Enables topology accounting for all IPv4 unicast topologies in the VRF associated with a particular interface.

traceroute

To discover the routes that packets will actually take when traveling to their destination address, use the **traceroute** command in user EXEC or privileged EXEC mode.

traceroute [**vrf** *vrf-name* | **topology** *topology-name*] [*protocol*] *destination*

Syntax Description

vrf *vrf-name*	(Optional) Specifies the name of a Virtual Private Network (VPN) routing and forwarding (VRF) instance table in which to find the destination address. The only keyword that you can select for the *protocol* argument when you use the **vrf** *vrf-name* keyword-argument pair is the **ip** keyword.
topology *topology-name*	(Optional) Specifies the name of the topology instance. The *topology-name* argument is case-sensitive; "VOICE" and "voice" specify different topologies.
protocol	(Optional) Protocol keyword, either **appletalk**, **clns**, **ip**, **ipv6**, **ipx**, **oldvines**, or **vines**. When not specified, the *protocol* argument is based on an examination by the software of the format of the *destination* argument. The default protocol is IP.
destination	(Optional in privileged EXEC mode; required in user EXEC mode) The destination address or hostname for which you want to trace the route. The software determines the default parameters for the appropriate protocol and the tracing action begins.

Command Default

When not specified, the *protocol* argument is determined by the software examining the format of the *destination* argument. For example, if the software finds a *destination* argument in IP format, the protocol value defaults to IP.

Command Modes

User EXEC (>)
Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.0(5)T	The **vrf** *vrf-name* keyword and argument were added.
12.2(2)T	Support for IPv6 was added.
12.0(21)ST	Support for IPv6 was added.
12.0(22)S	Support for IPv6 was added.
12.2(11)T	The **traceroute** command test characters for IPv6 were updated. A new error message was added.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Release	Modification
12.3(5)	A line was added to the interactive **traceroute vrf** command, so that you can resolve the autonomous system number through the use of the global table or a VRF table, or you can choose not to resolve the autonomous system.
12.0(26)S1	Changes to the command were integrated into Cisco IOS Release 12.0(26)S1.
12.2(20)S	Changes to the command were integrated into Cisco IOS Release 12.2(20)S.
12.2(28)SB	This command was integrated into Cisco IOS Release 12.2(28)SB.
12.2(25)SG	This command was integrated into Cisco IOS Release 12.2(25)SG.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.
12.2(33)SRB	The **topology** *topology-name* keyword and argument were added to support Multi-Topology Routing (MTR).
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.
Cisco IOS XE Release 3.2S	This command was modified. When the **vrf** keyword is used, the output displays the incoming VRF name/tag and the outgoing VRF name/tag.

Usage Guidelines

The **traceroute** command works by taking advantage of the error messages generated by routers when a datagram exceeds its hop limit value.

The **traceroute** command starts by sending probe datagrams with a hop limit of 1. Including a hop limit of 1 with a probe datagram causes the neighboring routers to discard the probe datagram and send back an error message. The **traceroute** command sends several probes with increasing hop limits and displays the round-trip time for each.

The **traceroute** command sends out one probe at a time. Each outgoing packet might result in one or more error messages. A time-exceeded error message indicates that an intermediate router has seen and discarded the probe. A destination unreachable error message indicates that the destination node has received and discarded the probe because the hop limit of the packet reached a value of 0. If the timer goes off before a response comes in, the **traceroute** command prints an asterisk (*).

The **traceroute** command terminates when the destination responds, when the hop limit is exceeded, or when the user interrupts the trace with the escape sequence. By default, to invoke the escape sequence, type **Ctrl-^ X**—by simultaneously pressing and releasing the **Ctrl**, **Shift**, and **6** keys, and then pressing the **X** key.

To use nondefault parameters and invoke an extended **traceroute** test, enter the command without a *protocol* or *destination* argument in privileged EXEC mode. You are stepped through a dialog to select the desired parameters. Extended **traceroute** tests are not supported in user EXEC mode. The user-level traceroute feature provides a basic trace facility for users who do not have system privileges. The *destination* argument is required in user EXEC mode.

If the system cannot map an address for a hostname, it returns a "%No valid source address for destination" message.

If the **vrf** *vrf-name* keyword and argument are used, the **topology** option is not displayed because only the default VRF is supported. The **topology** *topology-name* keyword and argument and the DiffServ Code Point (DSCP) option in the extended traceroute system dialog are displayed only if a topology is configured on the router.

In Cisco IOS XE Release 3.2S, output of the **traceroute** command with the **vrf** keyword was enhanced to make troubleshooting easier by displaying the incoming VRF name/tag and the outgoing VRF name/tag.

Examples

After you enter the **traceroute** command in privileged EXEC mode, the system prompts you for a protocol. The default protocol is IP.

If you enter a hostname or address on the same line as the **traceroute** command, the default action is taken as appropriate for the protocol type of that name or address.

The following example is sample dialog from the **traceroute** command using default values. The specific dialog varies somewhat from protocol to protocol.

```
Router# traceroute

Protocol [ip]:
Target IP address:
Source address:
DSCP Value [0]: ! Only displayed if a topology is configured on the router.
Numeric display [n]:
Timeout in seconds [3]:
Probe count [3]:
Minimum Time to Live [1]:
Maximum Time to Live [30]:
Port Number [33434]:
Loose, Strict, Record, Timestamp, Verbose [none]:
```

The following example displays output available in Cisco IOS XE Release 3.2S and later. Output of the **traceroute** command with the **vrf** keyword includes the incoming VRF name/tag and the outgoing VRF name/tag.

```
Router# traceroute vrf red 10.0.10.12

Type escape sequence to abort.
Tracing the route to 10.0.10.12
VRF info: (vrf in name/id, vrf out name/id)
  1 10.1.13.15 (red/13,red/13) 0 msec
    10.1.16.16 (red/13,red/13) 0 msec
    10.1.13.15 (red/13,red/13) 1 msec
  2 10.1.8.13 (red/13,red/13) 0 msec
    10.1.7.13 (red/13,red/13) 0 msec
    10.1.8.13 (red/13,red/13) 0 msec
  3 10.1.2.11 (red/13,blue/10) 1 msec 0 msec 0 msec
  4  *  *  *
```

Related Commands

Command	Description
ping (MTR)	Pings a destination within a specific topology.

use-topology

To configure a multicast topology to perform Reverse Path Forwarding (RPF) computations using a unicast topology Routing Information Base (RIB), use the **use-topology** command in address family topology configuration mode. To disable RPF computations using a unicast topology RIB, use the **no** form of this command.

use-topology unicast {**base** | *topology-name*}

no use-topology unicast {**base** | *topology-name*}

Syntax Description

unicast	Specifies a unicast sub-address family.
base	Specifies a base topology.
topology-name	A class-specific unicast topology.

Command Default

No default behavior or values.

Command Modes

Address family topology configuration (config-af-topology)

Command History

Release	Modification
12.2(33)SRB	This command was introduced.
12.2(33)SRE	This command was integrated into Cisco IOS Release 12.2(33)SRE.
15.0(1)M	This command was integrated into Cisco IOS Release 15.0(1)M.

Usage Guidelines

When this command is configured, the multicast topology uses routes in the specified unicast topology table to build multicast distribution trees.

This multicast RIB is not used when this command is enabled, even if the multicast RIB is populated and supported by a routing protocol.

Examples

The following example shows how to configure a multicast topology to perform RPF computations using a unicast topology RIB:

```
Router(config)# ip multicast-routing
Router(config)# ip multicast rpf multitopology
Router(config)# global-address-family ipv4 multicast
Router(config-af)# topology base
Router(config-af-topology)# use-topology unicast base
```