S through U

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 (config-router)

Command History

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

Usage Guidelines

A new configuration hierarchy, named scope, has been introduced into the BGP protocol. To implement Multitopology 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.

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

Device(config-router-scope)# neighbor 192.168.1.2 remote-as 40000

Device(config-router-scope)# address-family ipv4
Device(config-router-scope-af)# neighbor 192.168.1.2 activate

Device(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:

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

service-policy type class-routing

To attach the service policy to the policy map for Multitopology 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 device. 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:

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

```
Device(config-af)# service-policy type class-routing BLUE
Device(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 the Additional show ip bgp Commands and Descriptions table below.
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 is 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.
Cisco IOS XE Release 2.5	This command was integrated into Cisco IOS XE Release 2.5.

Usage Guidelines

The table below 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.

Table 1: 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.

Command	Description
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.

```
Device# 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
```

The table below describes the significant fields shown in the display.

Table 2: 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 device 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.

```
Device# 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
.
.
.
```

The table below describes the significant fields shown in the display.

Table 3: 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 device.
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.
last write	Time, in hh:mm:ss, since BGP last sent a message to this neighbor.

Field	Description
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 devices.
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.

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

show ip eigrp topology[**vrf** *vrf-name*| *autonomous-system-number*| *network* [*mask*]| *prefix*| **active**| **all-links**| **detail-links**| **frr**| **name**| **pending**| **summary**| **zero-successors**]

Syntax Description

vrf *vrf-name*	(Optional) Displays information about the specified virtual routing and forwarding (VRF) instance.
autonomous-system-number	(Optional) Autonomous system number.
network	(Optional) Network address.
mask	(Optional) Network mask.
prefix	(Optional) Network prefix in the format <network>/<length>; for example, 192.168.0.0/16.
active	(Optional) Displays all topology entries that are in the active state.
all-links	(Optional) Displays all entries in the EIGRP topology table (including nonfeasible-successor sources).
detail-links	(Optional) Displays all topology entries with additional details.
frr	(Optional) Displays information about Fast Reroute (FRR) loop-free alternates (LFAs).
name	(Optional) Displays the IPv4 topology table name. This name is the topology identifier and shows topology-related information for Multitopology Routing (MTR).
pending	(Optional) Displays all entries in the EIGRP topology table that are either waiting for an update from a neighbor or waiting to reply to a neighbor.
summary	(Optional) Displays a summary of the EIGRP topology table.
zero-successors	(Optional) Displays available routes that have zero successors.

Command Default

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

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
10.0	This command was introduced.
12.3(8)T	This command was modified. The output of 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	This command was modified. The **name** keyword was added to support MTR.
12.2(33)SXH	This command was integrated into Cisco IOS Release 12.2(33)SXH.
15.0(1)M	This command was modified. The **vrf** *vrf-name* keyword-argument pair was added.
12.2(33)SRE	This command was modified. The **vrf** *vrf-name* keyword-argument pair was added. The **name** keyword was removed.
Cisco IOS XE Release 2.5	This command was integrated into Cisco IOS XE Release 2.5.
15.1(3)S	This command was integrated into Cisco IOS Release 15.1(3)S. The output of the command was enhanced to display information about wide metrics.
Cisco IOS XE Release 3.4S	This command was modified. The output of the command was enhanced to display information about wide metrics.
Cisco IOS XE Release 3.5S	This command was modified. Information about the Equal Cost Multipath (ECMP) mode was included in the command output.
15.2(1)S	This command was modified. Information about the ECMP mode was included in the command output.

Release	Modification
15.2(2)S	This command was modified. The output of the command was enhanced to display route tag values in dotted-decimal format.
Cisco IOS XE Release 3.6S	This command was modified. The output of the command was enhanced to display route tag values in dotted-decimal format.
15.2(3)T	This command was modified. Information about the ECMP mode was included in the command output.
15.2(4)S	This command was modified. The **frr** keyword was added.
Cisco IOS XE Release 3.7S	This command was modified. The **frr** keyword was added.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY. The output of the command was enhanced to display information about wide metrics.

Usage Guidelines

Use the **show ip eigrp topology** command to display topology entries, feasible and nonfeasible paths, metrics, and states. This command can be used without any arguments or keywords to display only topology entries with feasible successors and feasible paths. The **all-links** keyword displays all paths, whether feasible or not, and the **detail-links** keyword displays additional details about these paths.

Use this command to display information about EIGRP named and EIGRP autonomous system configurations. This command displays the same information as the **show eigrp address-family topology** command. We recommend using the **show eigrp address-family topology** command.

Examples

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

```
Device# 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 192.0.2.1 (409600/128256), Ethernet0/0
P 172.16.1.0/24, 1 successors, FD is 409600
        via 192.0.2.1 (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 sample output from the **show ip eigrp topology** *prefix* command displays detailed information about a single prefix. The prefix shown is an EIGRP internal route.

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

EIGRP-IPv4 VR(vr1) Topology Entry for AS(1)/ID(10.1.1.2) for 10.0.0.0/8
  State is Passive, Query origin flag is 1, 1 Successor(s), FD is 82329600, RIB is 643200
```

```
  Descriptor Blocks:
  10.1.1.1 (Ethernet2/0), from 10.1.1.1, Send flag is 0x0
      Composite metric is (82329600/163840), route is Internal
      Vector metric:
        Minimum bandwidth is 16000 Kbit
        Total delay is 631250000 picoseconds
        Reliability is 255/255
        Load is ½55
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 10.1.1.1
```

The following sample output from the **show ip eigrp topology** *prefix* command displays detailed information about a single prefix. The prefix shown is an EIGRP external route.

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

EIGRP-IPv4 Topology Entry for AS(1)/ID(10.0.0.1) for 172.16.1.0/24
State is Passive, Query origin flag is 1, 1 Successor(s), FD is 409600, RIB is 643200
  Descriptor Blocks:
  172.16.1.0/24 (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 picoseconds
        Reliability is 255/255
        Load is ½55
        Minimum MTU is 1500
        Hop count is 1
        Originating router is 172.16.1.0/24
        External data:
        AS number of route is 0
        External protocol is Connected, external metric is 0
        Administrator tag is 0 (0x00000000)
```

The following sample output from the **show ip eigrp topology** *prefix* command displays ECMP mode information when the **no ip next-hop-self** command is configured without the **no-ecmp-mode** keyword in an EIGRP topology. The ECMP mode provides information about the path that is being advertised. If there is more than one successor, the top most path will be advertised as the default path over all interfaces, and "ECMP Mode: Advertise by default" will be displayed in the output. If any path other than the default path is advertised, "ECMP Mode: Advertise out <Interface name>" will be displayed.

```
Device# show ip eigrp topology 192.168.10.0/24

EIGRP-IPv4 Topology Entry for AS(1)/ID(10.10.100.100) for 192.168.10.0/24
State is Passive, Query origin flag is 1, 2 Successor(s), FD is 284160
  Descriptor Blocks:
  10.100.1.0 (Tunnel0), from 10.100.0.1, Send flag is 0x0
      Composite metric is (284160/281600), route is Internal
      Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 1100 microseconds
        Reliability is 255/255
        Load is ½55
        Minimum MTU is 1400
        Hop count is 1
        Originating router is 10.10.1.1
        ECMP Mode: Advertise by default
        10.100.0.2 (Tunnel1), from 10.100.0.2, Send flag is 0X0
        Composite metric is (284160/281600), route is Internal
        Vector metric:
        Minimum bandwidth is 10000 Kbit
        Total delay is 1100 microseconds
        Reliability is 255/255
        Load is ½55
        Minimum MTU is 1400
        Hop count is 1
        Originating router is 10.10.2.2
        ECMP Mode: Advertise out Tunnel1
```

The following sample output from the **show ip eigrp topology all-links** command displays all paths, even those that are not feasible:

```
Device# 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 10.1.4.3 (2586111744/2585599744), Serial3/0, serno 18
```

The following sample output from the **show ip eigrp topology detail-links** command displays additional details about routes:

```
Device# 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 10.10.1.2 (409600/128256), Ethernet0/0
P 172.16.1.0/24, 1 successors, FD is 409600, serno 14
        via 10.10.1.2 (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
```

The following sample output from the **show ip eigrp topology frr** command displays details about the LFAs in the EIGRP topology:

```
Device# show ip eigrp topology frr

EIGRP-IPv4 VR(test) Topology Table for AS(1)/ID(10.1.1.1)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status

P 192.168.2.0/24, 1 successors, FD is 131153920
        via 10.1.1.2 (131153920/163840), Ethernet0/0
        via 10.3.3.3 (137625600/6635520), Ethernet0/1, [LFA]
P 192.168.1.0/24, 1 successors, FD is 131153920
        via 10.1.1.2 (131153920/163840), Ethernet0/0
        via 10.4.4.4 (137625600/6635520), Ethernet0/2, [LFA]
        via 10.3.3.3 (137625600/6635520), Ethernet0/1
P 192.168.4.0/32, 1 successors, FD is 131727360
        via 10.4.4.4 (131727360/7208960), Ethernet0/2
P 192.168.3.0/24, 1 successors, FD is 131072000
        via Connected, Ethernet0/1
P 192.168.5.0/24, 1 successors, FD is 131072000
        via Connected, Ethernet0/0
P 10.10.10.0/24, 1 successors, FD is 262144000
        via 10.1.1.2 (262144000/196608000), Ethernet0/0
        via 10.4.4.4 (131727360/7208960), Ethernet0/2, [LFA]
```

The table below describes the significant fields shown in the displays.

Table 4: 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 the destination. Update, Query, and Reply refer to the type of packet that is being sent. • P - Passive—Indicates that no EIGRP computations are being performed for this route. • A - Active—Indicates that EIGRP computations are being performed for this route. • 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. • s - sia status—Indicates that the EIGRP query packet is in stuck-in-active (SIA) status.
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 the 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 became active. This value is used in the feasibility condition check. If the reported distance of the device is less than the feasible distance, the feasibility condition is met and that route becomes a feasible successor. After the software determines that it has a feasible successor, the software need not send a query for that destination.
via	Next-hop address that advertises the passive route.

Related Commands

Command	Description
show eigrp address-family topology	Displays entries in the EIGRP address-family 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** *name* keyword and 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 Multitopology 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:

```
Device# 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
```

The table below describes the significant fields shown in the display.

Table 5: 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. The range is 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 device.
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	This command was modified. The **brief** keyword was added.
12.2(15)T	This command was modified. The **brief** keyword was added.
12.2(33)SRA	This command was integrated into Cisco IOS Release 12.2(33)SRA.

Release	Modification
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.
15.1(3)S	This command was modified to display output when loop-free alternate (LFA) Fast Reroute (FRR) is enabled on an interface and whether it can be a protected or a protecting interface.

Examples

The following is sample output from the **show ip ospf interface** command when Ethernet interface 0/0 is specified. It shows that LFA and FRR is enabled on the interface and that it can be both a protected and a protecting interface.

```
Device# 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
  Can be protected by per-prefix Loop-free FastReroute
  Can be used for per-prefix Loop-free FastReroute repair paths
  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)
```

In 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:

```
Device# 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 brief 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.

```
Device# 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)
```

In 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:

```
Device# 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
.
.
.
```

The table below describes the significant fields shown in the displays.

Table 6: 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.

Field	Description
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 device 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:

```
Device# 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
```

The table below describes the significant fields shown in the display.

Table 7: 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.
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:

```
Device# 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)
```

The table below describes the significant fields shown in the display.

Table 8: 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 device.
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:

```
Device# show ip protocols topology DATA summary

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

The table below describes the significant fields shown in the display.

Table 9: 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 mask* 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.

Release	Modification
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.
15.0(1)SY	This command was integrated into Cisco IOS Release 15.0(1)SY.

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:

```
Device# 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
```

The table below describes the significant fields shown in the display.

Table 10: 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 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:

```
Device# 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
```

The table below describes the significant fields shown in the display.

Table 11: 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:

```
Device# 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
```

The table below describes the significant fields shown in the display.

Table 12: 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.
via...	Specifies the address of the next device 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.
15.1(2)SNG	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Examples

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

```
Device# 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
```

In Cisco IOS Release 12.2(33)SRC, the following is sample output for the **show ip static route** command:

```
Device# 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]
```

The table below describes the significant fields shown in the display.

Table 13: 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 device to the remote network.

show ip static route bfd

To display information about the IPv4 static Bidirectional Forwarding Detection (BFD) configuration from specific configured BFD groups and nongroup entries, use the **show ip static route bfd** command in user EXEC or privileged EXEC mode.

show ip static route bfd [*interface-type interface-number* [*destination-ip-address*]] [**group** [*group-name*]] [**vrf** *destination-vrf-name*] [*destination-ip-address* [**vrf** *source-vrf-name*] [*source-ip-address*]]

Syntax Description

interface-type interface-number	(Optional) Interface type and interface number for which BFD is configured.
destination-ip-address	(Optional) Multihop BFD destination IP address or the gateway IP address.
group *group-name*	(Optional) Specifies a BFD group and group name.
vrf	(Optional) Specifies the Virtual Routing and Forwarding (VRF) instance.
destination-vrf-name	(Optional) Destination VRF name.
source-vrf-name	(Optional) Source VRF name.
source-ip-address	(Optional) Multihop BFD source IP address.

Command Modes

User EXEC (>)

Privileged EXEC (#)

Command History

Release	Modification
15.1(2)S	This command was introduced.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
15.1(1)SY	This command was integrated into Cisco IOS Release 15.1(1)SY.
15.2(3)S	This command was modified. The **vrf** keyword, and *interface-type*, *interface-number*, *destination-ip-address*, *source-ip-address*, *destination-vrf-name*, and *source-vrf-name* arguments were added.

Usage Guidelines

You can specify a BFD group for a set of BFD-tracked static routes. Nongroup entries are BFD-tracked static routes for which a BFD group is not specified. Use the **ip route static bfd** command to configure static route BFD neighbors.

Use the **show ip static route bfd** command to display information about the IPv4 static BFD configuration from specific configured BFD groups and nongroup entries. The **group** *group-name* keyword and argument specifies a BFD group and BFD group name.

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

```
Device# show ip static route bfd group group1

Codes in []: R - Reachable, U - Unreachable, L - Loop, D - Not Tracked
GigabitEthernet1/1 10.1.1.1 [U] [group1, Active]
GigabitEthernet1/2 10.2.2.2 [U] [group1, Passive]
```

The following table describes the significant fields shown in the display.

Table 14: show ip static route bfd group Field Descriptions

Field	Description
GigabitEthernet1/1	Interface for which the BFD session is initiated.
10.1.1.1	Next-hop IP address.
group1	BFD group name.
Active	Active member of the group.
GigabitEthernet1/2	Interface for which the BFD session is initiated.
10.2.2.2	Next-hop IP address.
Passive	Passive member of the group.

Related Commands

Command	Description
ip route static bfd	Specifies static route BFD neighbors.
show ip static route	Displays static route database information.

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:

```
Device# 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
```

The table below 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 Multitopology 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:

```
Device# 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.
```

The table below 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 Multitopology 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.
Cisco IOS XE Release 2.5	This command was integrated into Cisco IOS XE Release 2.5.

Usage Guidelines

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

Examples

In Release 12.0(29)S, the **show isis neighbors** command is entered to display information about the IS-IS neighbor Device1.

```
Device5# 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
```

The **show isis neighbors detail** command is entered to display more detailed information about the IS-IS neighbor Device1.

```
Device5# 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
```

In Release 12.2(33)SRB, the **show isis neighbors detail** command is entered to verify the status of the IS-IS neighbor Device1 for a network that has MTR configured. For each of the topologies - unicast, DATA and VOICE, the interface information is displayed.

```
Device5# 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
```

The table below 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 device.
Interface	Interface from which the system was learned.
IP Address	IP address of the neighbor device.
State	Indicates whether the state of the IS-IS neighbor is up or down.

Field	Description
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 device that indicates how it is connected to the local device.
Area Address(es)	Reachable area addresses from the device. For Level 1 LSPs, these are the area addresses configured manually on the originating device. For Level 2 LSPs, these are all the area addresses for the area to which this device belongs.
SNPA	Subnetwork point of attachment. This is the data-link address.
State Changed	State change.
LAN Priority	Priority of the LAN.
Remote TID	Neighbor device topology IDs.
Local TID	Local device topology IDs.

show mtm table

To display information about the classifier values and the differentiated services 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 Multitopology 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:

```
Device# 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
```

The table below 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.
Classifier: ClassID:	Displays the class identifier.

Field	Description
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 Multitopology 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:

```
Device# 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:

```
Device# 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
```

The table below 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 Multitopology 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 device 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:

```
Device# 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:
```

The table below 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 Multitopology 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 device.
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 device 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:

```
Device# show topology

Topology                    Address Family  Associated VRF  State
base                        ipv4            default         UP
VOICE                       ipv4            default         UP
base                                        default         UP
```

The table below 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:

```
Device# show topology detail

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

The table below 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.
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.

```
Device# 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:

```
Device# 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 device. 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 device to temporarily place the VOICE topology in a shutdown state:

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

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a device.
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 Multitopology Routing (MTR) 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 SNMPv1 or v2c

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

For SNMPv3

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 SNMPv2c, specifies an SNMP community string.
ro	(Optional) In SNMPv2c, specifies read-only access.
rw	(Optional) In SNMPv2c, specifies read/write access.
user *username*	(Optional) In SNMPv3, specifies an SNMP user.
credential	(Optional) In SNMPv3, specifies if a user password is already configured and saved.
encrypted	(Optional) In SNMPv3, specifies that passwords are Message Digest5 (MD5) or Secure Hash Algorithm (SHA) digests.
auth	(Optional) In SNMPv3, specifies authentication parameters for a user.
md5 *password*	(Optional) In SNMPv3, uses an Hash-based Message Authentication Code (HMAC) MD5 algorithm for authentication.
sha *password*	(Optional) In SNMPv3, uses an HMAC SHA algorithm for authentication.
access	(Optional) In SNMPv3, specifies an access list associated with a group.

access-list-number	(Optional) In SNMPv3, a standard access list number in the range of 1 to 99.
access-list-name	(Optional) In SNMPv3, an access list name.
ipv6 *access-list-name*	(Optional) In SNMPv3, 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.
15.0(1)SY	This command was integrated into Cisco IOS Release 15.0(1)SY.
15.1(1)SG	This command was integrated into Cisco IOS Release 15.1(1)SG.
Cisco IOS XE Release 3.3SG	This command was integrated into Cisco IOS XE Release 3.3SG.
15.3(2)T	This command was integrated into Cisco IOS Release 15.3(2)T.

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:

```
Device(config)# ip vrf companyA
Device(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:

```
Device(config)# vrf definition companyA
Device(config-vrf)# address-family ipv4
Device(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 argument is case-sensitive.
base	Specifies the base topology.

Command Default

No default behavior or values

Command Modes

Router scope address family configuration (config-router-scope-af)

Command History

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

Usage Guidelines

The **topology** (BGP) command is used in a Multitopology 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:

```
Device(config)# global-address-family ipv4
Device(config-af)# topology VOICE
Device(config-af-topology)# all-interfaces
Device(config-af-topology)# exit
Device(config-af)# exit
Device(config)# router bgp 45000
```

```
Device(config-router)# scope global
Device(config-router-scope)# bgp default ipv4-unicast
Device(config-router-scope)# neighbor 192.168.3.2 remote-as 50000
Device(config-router-scope)# address-family ipv4 unicast
Device(config-router-scope-af)# topology VOICE
Device(config-router-scope-af-topo)# bgp tid 100
Device(config-router-scope-af-topo)# neighbor 192.168.3.2 activate
Device(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 range is 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 Multitopology 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 devices 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:

```
Device(config)# router eigrp 1
Device(config-router)# address-family ipv4 unicast autonomous-system 3
Device(config-router-af)# topology VOICE tid 100
Device(config-router-af-topology)# no auto-summary
Device(config-router-af-topology)# network 192.168.0.0 0.0.255.255
Device(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 device 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.
15.2(3)T	This command was integrated into Cisco IOS Release 15.2(3)T.

Usage Guidelines

Use the **topology** (global) command 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 device. 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 device 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 device looks 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 device first looks in the class-specific topology FIB. If a covering forwarding entry is not found, the device then looks in the base topology FIB.

- Maximum route limit—A limit for the number of routes that are 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 device is configured to use incremental forwarding mode and to generate warning messages when 1000 routes have been accepted/installed in the VOICE topology RIB:

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

Related Commands

Command	Description
all-interfaces	Configures a topology instance to use all interfaces on a device.
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 Multitopology routing (MTR) topology instance on an interface, use the **topology** command in interface configuration mode. To disable the topology interface configuration and configure the device 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.
15.2(3)T	This command was integrated into Cisco IOS Release 15.2(3)T.

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 device 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.

```
Device(config)# interface Ethernet 0/0
Device(config-if)# topology ipv4 VOICE
Device(config-if-topology)# ip ospf cost 10
Device(config-if-topology)# exit
Device(config-if)# topology ipv4 multicast VIDEO disable
Device (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) Multitopology 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. This keyword is available only for MTR multicast for IPv4.
topology-name	(Required) Topology name. This argument is case-sensitive and is available only for MTR unicast for IPv4 and Ipv6.
tid *number*	(Required) Specifies the topology ID number. The range is 1 to 65535. This keyword and 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.
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 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	Topology name. This argument is case-sensitive; VOICE and voice specify different topologies.
tid number	Specifies a topology ID number. The range is 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 Multitopology 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 device 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 device 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:

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

```
Device(config)# global-address-family ipv4
Device(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 VPN virtual 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 you want to trace of 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.

Release	Modification
12.2(2)T	This command was modified, support for IPv6 was added.
12.0(21)ST	This command was modified, support for IPv6 was added.
12.0(22)S	This command was modified, 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.
12.3(5)	This command was modified, 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	This command was integrated into Cisco IOS Release 12.0(26)S1.
12.2(20)S	This command was 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-argument pair was added to support Multitopology 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.
15.0(1)SY	This command was modified. When the **vrf** keyword is used, the output displays the incoming VRF name/tag and the outgoing VRF name/tag.
15. 2 (2)SNI	This command was implemented on the Cisco ASR 901 Series Aggregation Services Routers.

Usage Guidelines

The **traceroute** command works by taking advantage of the error messages generated by devices 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 devices 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 device 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, simultaneously press and release 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 then follow a series of steps 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-argument pair is used, the **topology** option is not displayed because only the default VRF instance is supported. The **topology** *topology-name* keyword-argument pair and the DiffServ Code Point (DSCP) option in the extended traceroute system dialog are displayed only if a topology is configured on the device.

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 output from the **traceroute** command using default values in privileged EXEC mode. The specific output varies somewhat from protocol to protocol.

```
Device# traceroute
Protocol [ip]:
Target IP address:
Source address:
DSCP Value [0]: ! Only displayed if a topology is configured on the device.
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.

```
Device# 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 for MTR.

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.
15.0(1)SY	This command was integrated into Cisco IOS Release 15.0(1)SY.

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:

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

```
Device(config)# global-address-family ipv4 multicast
Device(config-af)# topology base
Device(config-af-topology)# use-topology unicast base
```