BGP Support for MTR

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BGP support for MTR introduces a new configuration hierarchy and command-line interface (CLI) commands to support Multi-Topology Routing (MTR) topologies. The new configuration hierarchy, or scope, can be implemented by BGP independently of MTR. MTR allows the configuration of service differentiation through class-based forwarding. MTR supports multiple unicast topologies and a separate multicast topology. A topology is a subset of the underlying network (or base topology) characterized by an independent set of Network Layer Reachability Information (NLRI).

Finding Feature Information in This Module

Your Cisco IOS software release may not support all of the features documented in this module. To reach links to specific feature documentation in this module and to see a list of the releases in which each feature is supported, use the "Feature Information for BGP Support for MTR" section on page 40.

Finding Support Information for Platforms and Cisco IOS and Catalyst OS Software Images

Use Cisco Feature Navigator to find information about platform support and Cisco IOS and Catalyst OS software image support. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Contents

Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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Prerequisites for BGP Support for MTR

- This document assumes that you are familiar with the feature Multi-Topology Routing, first released in Cisco IOS Release 12.2(33)SRB.
- A global MTR topology configuration has been configured and activated.
- IP routing and CEF are enabled.

Restrictions for BGP Support for MTR

- Redistribution within a topology is permitted. Redistribution from one topology to another is not permitted. This restriction is designed to prevent routing loops from occurring. You can use topology translation or topology import functionality to move routes from one topology to another.
- Only the IPv4 address family (multicast and unicast) is supported.
- Only a single multicast topology can be configured, and only the base topology can be specified if a multicast topology is created.

Information About BGP Support for MTR

Before using BGP to support MTR, you should be familiar with the following concepts:

BGP Network Scope

A new configuration hierarchy, named scope, has been introduced into the BGP protocol. To implement MTR 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. BGP commands configured under the scope hierarchy are configured for a single network (globally), or on a per-VRF basis, and are referred to as scoped commands. The scope hierarchy can contain one or more address families.

MTR CLI Hierarchy Under BGP

The BGP CLI has been modified to provide backwards compatibility for pre-MTR BGP configuration and to provide a hierarchical implementation of MTR. Router configuration mode is backwards compatible with the pre-address family and pre-MTR configuration CLI. Global commands that affect all networks are configured in this configuration mode. For address-family and topology configuration, general session commands and peer templates can be configured to be used in the address-family or topology configuration modes.

After any global commands are configured, the scope is defined either globally or for a specific VRF. Address family configuration mode is entered by configuring the **address-family** command in router scope configuration mode or router configuration mode. Unicast is the default address family if no subaddress family (SAFI) is specified. MTR supports only the IPv4 address family with a SAFI of unicast or multicast. Entering address family configuration mode from router configuration mode configures BGP to use pre-MTR-based CLI. This configuration mode is backwards compatible with pre-existing address family configurations. Entering address family configuration mode from router scope configuration mode configures the router to use the hierarchical CLI that supports MTR. Address family configuration parameters that are not specific to a topology are entered in this address family configuration mode.

BGP topology configuration mode is entered by configuring the **topology** (BGP) command in address family configuration mode. Up to 32 topologies (including the base topology) can be configured on a router. The topology ID is configured by entering the **bgp tid** command. All address family and subaddress family configuration parameters for the topology are configured here.

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

The following shows the hierarchy levels that are used when configuring BGP for MTR implementation:

```
router bgp <autonomous-system-number>
 ! global commands
 scope {global | vrf <vrf-name>}
  ! scoped commands
  address-family {<afi>} [<safi>]
   ! address family specific commands
   topology {<topology-name> | base}
    ! topology specific commands
```

BGP Sessions for Class-Specific Topologies

MTR is configured under BGP on a per-session basis. The base unicast and multicast topologies are carried in the global (default) session. A separate session is created for each class-specific topology that is configured under a BGP routing process. Each session is identified by its topology ID. BGP performs a best-path calculation individually for each class-specific topology. A separate RIB and FIB are maintained for each session.

Topology Translation Using BGP

Depending on the design and policy requirements for your network, you may need to install routes from a class-specific topology on one router in a class-specific topology on a neighboring router. Topology translation functionality using BGP provides support for this operation. Topology translation is BGP neighbor-session based. The **neighbor translate-topology** command is configured using the IP address and topology ID from the neighbor.

The topology ID identifies the class-specific topology of the neighbor. The routes in the class-specific topology of the neighbor are installed in the local class-specific RIB. BGP performs a best-path calculation on all installed routes and installs these routes into the local class-specific RIB. If a duplicate route is translated, BGP will select and install only one instance of the route per standard BGP best-path calculation behavior.

Topology Import Using BGP

Topology import functionality using BGP is similar to topology translation. The difference is that routes are moved between class-specific topologies on the same router using BGP. This function is configured by entering the **import topology** command. The name of the class-specific topology or base topology is specified when entering this command. Best-path calculations are run on the imported routes before they are installed into the topology RIB. This command also includes a **route-map** keyword to allow you to filter routes that are moved between class-specific topologies.

How to Configure BGP Support for MTR

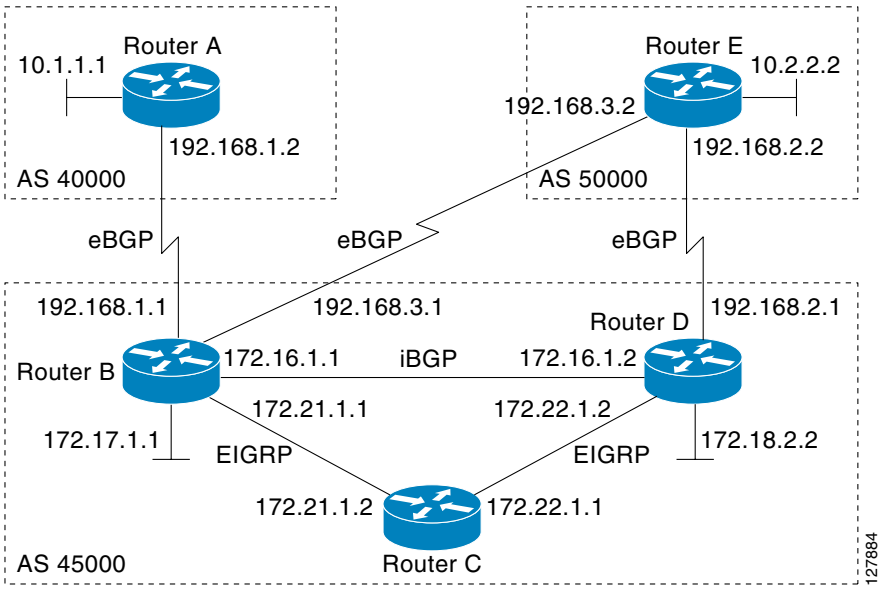
Before performing the following tasks, you must have configured MTR topologies. For more details, see the Multi-Topology Routing feature first released in Cisco IOS Release 12.2(33)SRB.

- Activating an MTR Topology Using BGP, page 4
- Importing Routes from an MTR Topology Using BGP, page 9

Activating an MTR Topology Using BGP

Perform this task to activate an MTR topology inside an address family using BGP. This task is configured on Router B in Figure 1 and must also be configured on Router D and Router E. In this task, a scope hierarchy is configured to apply globally and a neighbor is configured under router scope configuration mode. Under the IPv4 unicast address family, an MTR topology that applies to video traffic is activated for the specified neighbor. There is no interface configuration mode for BGP topologies.

Figure 1 BGP Network Diagram



The BGP CLI has been modified to provide backwards compatibility for pre-MTR BGP configuration and to provide a hierarchical implementation of MTR. A new configuration hierarchy, named scope, has been introduced into the BGP protocol. To implement MTR 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 following shows the hierarchy levels that are used when configuring BGP for MTR implementation:

```
router bgp <autonomous-system-number>
 ! global commands
 scope {global | vrf <vrf-name>}
  ! scoped commands
  address-family {<afi>} [<safi>]
   ! address family specific commands
   topology {<topology-name> | base}
    ! topology specific commands
```

Before using BGP to support MTR, you should be familiar with all the concepts documented in the "Information About BGP Support for MTR" section on page 2.

Prerequisites

- A global MTR topology configuration has been configured and activated.
- IP routing and CEF are enabled.

Restrictions

- Redistribution within a topology is permitted. Redistribution from one topology to another is not permitted. This restriction is designed to prevent routing loops. You can use topology translation or topology import functionality to move routes from one topology to another.
- Only the IPv4 address family (multicast and unicast) is supported.

- Only a single multicast topology can be configured, and only the base topology can be specified if a multicast topology is created.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router bgp** *autonomous-system-number*
4. **scope** {**global** | **vrf** *vrf-name*}
5. **neighbor** {*ip-address* | *peer-group-name*} **remote-as** *autonomous-system-number*
6. **neighbor** {*ip-address* | *peer-group-name*} **transport** {**connection-mode** {**active** | **passive**} | **path-mtu-discovery** | **multi-session** | **single-session**}
7. **address-family ipv4** [**mdt** | **multicast** | **unicast**]
8. **topology** {**base** | *topology-name*}
9. **bgp tid** *number*
10. **neighbor** {*ip-address*} **activate**
11. **neighbor** {*ip-address* | *peer-group-name*} **translate-topology** *number*
12. **end**
13. **clear ip bgp topology** {***** | *topology-name*} {*as-number* | **dampening** [*network-address* [*network-mask*]] | **flap-statistics** [*network-address* [*network-mask*]] | **peer-group** *peer-group-name* | **table-map** | **update-group** [*number* | *ip-address*]} [**in** [**prefix-filter**] | **out** | **soft** [**in** [**prefix-filter**] | **out**]]
14. **show ip bgp topology** {***** | *topology-name*} **summary**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**`enable`** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**`configure terminal`** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**`router bgp`** *`autonomous-system-number`* **Example:** `Router(config)# router bgp 45000`	Enters router configuration mode to create or configure a BGP routing process.

	Command or Action	Purpose
Step 4	**scope** {**global** | **vrf** *vrf-name*} **Example:** `Router(config-router)# scope global`	Defines the scope to the BGP routing process and enters router scope configuration mode. • BGP general session commands that apply to a single network, or a specified VRF, are entered in this configuration mode. • Use the **global** keyword to specify that BGP uses the global routing table. • Use the **vrf** keyword and *vrf-name* argument to specify that BGP uses a specific VRF routing table. The VRF must already exist.
Step 5	**neighbor** {*ip-address* | *peer-group-name*} **remote-as** *autonomous-system-number* **Example:** `Router(config-router-scope)# neighbor 172.16.1.2 remote-as 45000`	Adds the IP address of the neighbor in the specified autonomous system to the multiprotocol BGP neighbor table of the local router.
Step 6	**neighbor** {*ip-address* | *peer-group-name*} **transport** {**connection-mode** {**active** | **passive**} | **path-mtu-discovery** | **multi-session** | **single-session**} **Example:** `Router(config-router-scope)# neighbor 172.16.1.2 transport multi-session`	Enables a TCP transport session option for a BGP session. • Use the **connection-mode** keyword to specify the type of connection, either active or passive. • Use the **path-mtu-discovery** keyword to enable TCP transport path maximum transmission unit (MTU) discovery. • Use the **multi-session** keyword to specify a separate TCP transport session for each address family. • Use the **single-session** keyword to specify that all address families use a single TCP transport session.
Step 7	**address-family ipv4** [**mdt** | **multicast** | **unicast**] **Example:** `Router(config-router-scope)# address-family ipv4`	Specifies the IPv4 address family and enters router scope address family configuration mode. • Use the **mdt** keyword to specify IPv4 MDT address prefixes. • Use the **multicast** keyword to specify IPv4 multicast address prefixes. • Use the **unicast** keyword to specify the IPv4 unicast address family. By default, the router is placed in address family configuration mode for the IPv4 unicast address family if the **unicast** keyword is not specified with the **address-family ipv4** command. • Non-topology-specific configuration parameters are configured in this configuration mode.
Step 8	**topology** {**base** | *topology-name*} **Example:** `Router(config-router-scope-af)# topology VIDEO`	Configures the topology instance in which BGP will route class-specific or base topology traffic, and enters router scope address family topology configuration mode.

	Command or Action	Purpose
Step 9	**bgp tid** *number* **Example:** `Router(config-router-scope-af-topo)# bgp tid 100`	Associates a BGP routing process with the specified topology ID. • Each topology must be configured with a unique topology ID.
Step 10	**neighbor** *ip-address* **activate** **Example:** `Router(config-router-scope-af-topo)# neighbor 172.16.1.2 activate`	Enables the BGP neighbor to exchange prefixes for the NSAP address family with the local router. **Note** If you have configured a peer group as a BGP neighbor, you do not use this command because peer groups are automatically activated when any peer group parameter is configured.
Step 11	**neighbor** {*ip-address* | *peer-group-name*} **translate-topology** *number* **Example:** `Router(config-router-scope-af-topo)# neighbor 172.16.1.2 translate-topology 200`	(Optional) Configures BGP to install routes from a topology on another router to a topology on the local router. • The topology ID is entered for the *number* argument to identify the topology on the router.
Step 12	**end** **Example:** `Router(config-router-scope-af-topo)# end`	(Optional) Exits router scope address family topology configuration mode and returns to privileged EXEC mode.
Step 13	**clear ip bgp topology** {***** | *topology-name*} {*as-number* | **dampening** [*network-address* [*network-mask*]] | **flap-statistics** [*network-address* [*network-mask*]] | **peer-group** *peer-group-name* | **table-map** | **update-group** [*number* | *ip-address*]} [**in** [**prefix-filter**] | **out** | **soft** [**in** [**prefix-filter**] | **out**]] **Example:** `Router# clear ip bgp topology VIDEO 45000`	Resets BGP neighbor sessions under a specified topology or all topologies.
Step 14	**show ip bgp topology** {***** | *topology*} **summary** **Example:** `Router# show ip bgp topology VIDEO summary`	(Optional) Displays BGP information about a topology. • Most standard BGP keywords and arguments can be entered following the topology keyword. **Note** Only the syntax required for this task is shown. For more details, see the *Cisco IOS IP Routing Protocols Command Reference*.

Examples

The following example shows summary output for the **show ip bgp topology** command and the VIDEO topology:

```
Router# show ip bgp topology VIDEO summary

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

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

What to Do Next

Repeat this task for every topology that you want to enable, and repeat this configuration on all neighbor routers that are to use the topologies. If you want to import routes from one MTR topology to another on the same router, proceed to the next task.

Importing Routes from an MTR Topology Using BGP

Perform this task to import routes from one MTR topology to another on the same router, when multiple topologies are configured on the same router. In this task, a prefix list is defined to permit prefixes from the 10.2.2.0 network, and this prefix list is used with a route map to filter routes moved from the imported topology. A global scope is configured, address family IPv4 is entered, the VIDEO topology is specified, the VOICE topology is imported, and the routes are filtered using the route map named 10NET.

Prerequisites

- A global topology configuration has been configured and activated.
- IP routing and CEF are enabled.

Restrictions

- Redistribution within a topology is permitted. Redistribution from one topology to another is not permitted. This restriction is designed to prevent routing loops from occurring. You can use topology translation or topology import functionality to move routes from one topology to another.
- Only the IPv4 address family (multicast and unicast) is supported.
- Only a single multicast topology can be configured, and only the base topology can be specified if a multicast topology is created.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip prefix-list** *list-name* [**seq** *seq-value*] {**deny** *network/length* | **permit** *network/length*} [**ge** *ge-value*] [**le** *le-value*]
4. **route-map** *map-name* [**permit** | **deny**] [*sequence-number*]
5. **match ip address** {*access-list-number* [*access-list-number*... | *access-list-name*...] | *access-list-name* [*access-list-number*... | *access-list-name*] | **prefix-list** *prefix-list-name* [*prefix-list-name*...]}
6. **exit**
7. **router bgp** *autonomous-system-number*
8. **scope** {**global** | **vrf** *vrf-name*}
9. **address-family ipv4** [**mdt** | **multicast** | **unicast**]

10. **topology** {**base** | *topology-name*}
11. **import topology** {**base** | *topology-name*} [**route-map** *map-name*]
12. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**ip prefix-list** *list-name* [**seq** *seq-value*] {**deny** *network/length* | **permit** *network/length*} [**ge** *ge-value*] [**le** *le-value*] **Example:** `Router(config)# ip prefix-list TEN permit 10.2.2.0/24`	Configures an IP prefix list. • In this example, prefix list TEN permits advertising of the 10.2.2.0/24 prefix depending on a match set by the **match ip address** command.
Step 4	**route-map** *map-name* [**permit** | **deny**] [*sequence-number*] **Example:** `Router(config)# route-map 10NET`	Creates a route map and enters route map configuration mode. • In this example, the route map named 10NET is created.
Step 5	**match ip address** {*access-list-number* [*access-list-number...* | *access-list-name...*] | *access-list-name* [*access-list-number...*| *access-list-name*] | **prefix-list** *prefix-list-name* [*prefix-list-name...*]} **Example:** `Router(config-route-map)# match ip address prefix-list TEN`	Configures the route map to match a prefix that is permitted by a standard access list, an extended access list, or a prefix list. • In this example, the route map is configured to match prefixes permitted by prefix list TEN.
Step 6	**exit** **Example:** `Router(config-route-map)# exit`	Exits route map configuration mode and returns to global configuration mode.
Step 7	**router bgp** *autonomous-system-number* **Example:** `Router(config)# router bgp 50000`	Enters router configuration mode to create or configure a BGP routing process.

	Command or Action	Purpose
Step 8	**scope** {**global** | **vrf** *vrf-name*} **Example:** `Router(config-router)# scope global`	Defines the scope to the BGP routing process and enters router scope configuration mode. • BGP general session commands that apply to a single network, or a specified VRF, are entered in this configuration mode. • Use the **global** keyword to specify that BGP uses the global routing table. • Use the **vrf** keyword and *vrf-name* argument to specify that BGP uses a specific VRF routing table. The VRF must already exist.
Step 9	**address-family ipv4** [**mdt** | **multicast** | **unicast**] **Example:** `Router(config-router-scope)# address-family ipv4`	Enters router scope address family configuration mode to configure an address family session under BGP. • Non-topology-specific configuration parameters are configured in this configuration mode.
Step 10	**topology** {**base** | *topology-name*} **Example:** `Router(config-router-scope-af)# topology VIDEO`	Configures the topology instance in which BGP will route class-specific or base topology traffic, and enters router scope address family topology configuration mode.
Step 11	**import topology** {**base** | *topology-name*} [**route-map** *map-name*] **Example:** `Router(config-router-scope-af-topo)# import topology VOICE route-map 10NET`	(Optional) Configures BGP to move routes from one topology to another on the same router. • The **route-map** keyword can be used to filter routes that moved between topologies.
Step 12	**end** **Example:** `Router(config-router-scope-af-topo)# end`	(Optional) Exits router scope address family topology configuration mode, and returns to privileged EXEC mode.

Configuration Examples for BGP Support for MTR

This section contains the following configuration examples:

- Activating an MTR Topology Using BGP: Examples, page 12
- Importing Routes from an MTR Topology Using BGP: Example, page 14

Activating an MTR Topology Using BGP: Examples

This section contains the following configuration examples:

- BGP Topology Translation Configuration, page 12
- BGP Scope Global and VRF Configuration, page 12
- BGP Topology Verification, page 13

BGP Topology Translation Configuration

The following example configures BGP in the VIDEO topology and configures topology translation with the 192.168.2.2 neighbor:

```
router bgp 45000
 scope global
  neighbor 172.16.1.1 remote-as 50000
  neighbor 192.168.2.2 remote-as 55000
  neighbor 172.16.1.1 transport multi-session
  neighbor 192.168.2.2 transport multi-session
   address-family ipv4
    topology VIDEO
     bgp tid 100
     neighbor 172.16.1.1 activate
     neighbor 192.168.2.2 activate
     neighbor 192.168.2.2 translate-topology 200
     end
clear ip bgp topology VIDEO 50000
```

BGP Scope Global and VRF Configuration

The following example shows how to configure a global scope for a unicast topology and also for a multicast topology. After exiting the router scope configuration mode, a scope is configured for the VRF named DATA.

```
router bgp 45000
 scope global
  bgp default ipv4-unicast
  neighbor 172.16.1.2 remote-as 45000
  neighbor 192.168.3.2 remote-as 50000
  address-family ipv4 unicast
   topology VOICE
   bgp tid 100
   neighbor 172.16.1.2 activate
   exit
  address-family ipv4 multicast
   topology base
    neighbor 192.168.3.2 activate
    exit
   exit
  exit
 scope vrf DATA
  neighbor 192.168.1.2 remote-as 40000
  address-family ipv4
   neighbor 192.168.1.2 activate
   end
```

BGP Topology Verification

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

```
Router# show ip bgp topology VIDEO summary

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

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

The following partial output displays BGP neighbor information under the VIDEO topology:

```
Router# show ip bgp topology VIDEO neighbors 172.16.12

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
.
.
.
```

Importing Routes from an MTR Topology Using BGP: Example

The following example shows how to configure an access list to be used by a route map named BLUE to filter routes imported from the MTR topology named VOICE. Only routes with the prefix 192.168.1.0 are imported.

```
access-list 1 permit 192.168.1.0 0.0.0.255
route-map BLUE
 match ip address 1
 exit
router bgp 50000
 scope global
  neighbor 10.1.1.2 remote-as 50000
  neighbor 172.16.1.1 remote-as 60000
   address-family ipv4
    topology VIDEO
     bgp tid 100
     neighbor 10.1.1.2 activate
     neighbor 172.16.1.1 activate
     import topology VOICE route-map BLUE
     end
clear ip bgp topology VIDEO 50000
```

Where to Go Next

To configure other IP routing protocols to support MTR and to perform other MTR-related tasks, see the Multi-Topology Routing feature first released in Cisco IOS Release 12.2(33)SRB.

Additional References

The following sections provide references related to the BGP Support for Multi-Topology Routing feature.

Related Documents

Related Topic	Document Title
IP routing protocol commands: complete command syntax, command modes, command history, defaults, usage guidelines, and examples	*Cisco IOS IP Routing Protocols Command Reference*

Standards

Standard	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIB	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFC	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password. If you have a valid service contract but do not have a user ID or password, you can register on Cisco.com.	http://www.cisco.com/techsupport

Command Reference

This section documents only commands that are new or modified.

- **address-family ipv4 (BGP)**
- **bgp tid**
- **clear ip bgp topology**
- **import topology**
- **neighbor translate-topology**
- **neighbor transport**
- **scope**
- **show ip bgp topology**
- **topology (BGP)**

address-family ipv4 (BGP)

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

Syntax Available Under Router Configuration Mode

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

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

Syntax Available Under Router Scope Configuration Mode

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

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

Syntax Description

mdt	(Optional) Specifies an IPv4 multicast distribution (MDT) tree address-family session.
multicast	(Optional) Specifies IP Version 4 multicast address prefixes.
tunnel	(Optional) Specifies an IPv4 routing session for multipoint tunneling.
unicast	(Optional) Specifies IP Version 4 unicast address prefixes. This is the default.
vrf *vrf-name*	(Optional) Specifies the name of the VPN routing and forwarding (VRF) instance to associate with subsequent IP Version 4 address family configuration mode commands.

Command Default

IP Version 4 address prefixes are not enabled.

Command Modes

Router configuration
Router scope configuration

Command History

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

Usage Guidelines

The **address-family ipv4** command replaces the **match nlri** and **set nlri** commands. The **address-family ipv4** command places the router in address family configuration mode (prompt: `config-router-af)`, from which you can configure routing sessions that use standard IP Version 4 address prefixes. To leave address family configuration mode and return to router configuration mode, type **exit**.

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

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

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

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

Examples

The following example places the router in address family configuration mode for the IP Version 4 address family:

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

Multicast Example

The following example places the router in address family configuration mode and specifies only multicast address prefixes for the IP Version 4 address family:

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

Unicast Example

The following example places the router in address family configuration mode and specifies unicast address prefixes for the IP Version 4 address family:

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

VRF Example

The following example places the router in address family configuration mode and specifies **cisco** as the name of the VRF instance to associate with subsequent IP Version 4 address family configuration mode commands:

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

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

Tunnel Example

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

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

Router Scope Configuration Mode Example

The following example shows how to configure the IPv4 address family under router scope configuration. In this example, the scope hierarchy is enabled globally. the router enters address family configuration mode, and only multicast address prefixes for the IP Version 4 address family are specified:

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

Related Commands

Command	Description
address-family ipv6	Enters address family configuration mode for configuring routing sessions, such as BGP, that use standard IPv6 address prefixes.
address-family vpnv4	Enters address family configuration mode for configuring routing sessions such as BGP, RIP, or static routing sessions that use standard VPN Version 4 address prefixes.
bgp default ipv4-unicast	Enables the IPv4 unicast address family on all neighbors.
neighbor activate	Enables the exchange of information with a BGP neighboring router.
neighbor remote-as	Adds an entry to the BGP or multiprotocol BGP neighbor table.
scope	Defines the scope for a BGP routing session and enters router scope configuration mode.

bgp tid

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

bgp tid *number*

no bgp tid

Syntax Description

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

Command Default

No ID is associated with an MTR topology instance.

Command Modes

Router scope address family topology configuration

Command History

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

Usage Guidelines

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

Examples

The following example configures a topology ID of 100 under the VOICE topology instance:

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

Related Commands

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

clear ip bgp topology

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

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

Syntax Description

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

Command Modes

Privileged EXEC

Command History

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

Usage Guidelines

The **clear ip bgp topology** command clears BGP session information under the specified topology or for all topologies. This command can be used to initiate a hard reset or soft reconfiguration. A hard reset tears down and rebuilds the specified peering sessions and rebuilds the BGP routing tables. A soft reconfiguration uses stored prefix information to reconfigure and activate BGP routing tables without

tearing down existing peering sessions. Soft reconfiguration uses stored update information, at the cost of additional memory for storing the updates, to allow you to apply new BGP policy without disrupting the network. Soft reconfiguration can be configured for inbound or outbound sessions.

Generating Updates from Stored Information

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

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

Use this command whenever any of the following changes occur:

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

Dynamic Inbound Soft Reset

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

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

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

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

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

Examples

The following example configures soft reconfiguration for the inbound sessions with neighbors in the autonomous system 45000. The outbound sessions are unaffected.

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

Related Commands

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

import topology

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

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

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

Syntax Description

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

Command Default

No routes are imported from other topologies.

Command Modes

Router scope address family topology configuration

Command History

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

Usage Guidelines

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

Examples

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

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

Related Commands

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

neighbor translate-topology

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

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

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

Syntax Description

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

Command Default

No routes are translated from a topology on another router.

Command Modes

Router scope address family topology configuration

Command History

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

Usage Guidelines

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

Examples

The following example configures BGP to translate the topology with the 255 ID from the 192.168.3.1 neighbor:

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

Related Commands

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

neighbor transport

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

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

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

Syntax Description

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

Command Default

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

Command Modes

Address family configuration
Router configuration

Command History

Release	Modification
12.4	This command was introduced.
12.2(33)SRA	The **path-mtu-discovery** keyword was added.
12.2(33)SRB	The **multi-session** and **single-session** keywords were added.

Usage Guidelines

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

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

Examples

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

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

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

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

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

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

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

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

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

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

Related Commands

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

scope

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

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

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

Syntax Description

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

Command Default

No scope is defined for a BGP routing session.

Command Modes

Router configuration

Command History

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

Usage Guidelines

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

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

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

Examples

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

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

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

Related Commands

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

show ip bgp topology

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

With BGP show Command Argument

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

With IP Prefix and Mask Length Syntax

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

With Network Address Syntax

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

Syntax Description

*	Displays all routing topology instances.
topology	Name of topology for which information is displayed.
bgp-keyword	(Optional) Argument representing a **show ip bgp** command keyword that can be added to this command. See Table 1.
ip-prefix/length	(Optional) The IP prefix address (in dotted decimal format) and the length of the mask (0 to 32). The slash mark must be included.
bestpath	(Optional) Displays the bestpath for the specified prefix.
longer-prefixes	(Optional) Displays the route and more specific routes.
injected	(Optional) Displays more specific routes that were injected because of the specified prefix.
multipaths	(Optional) Displays the multipaths for the specified prefix.
shorter-prefixes	(Optional) Displays the less specific routes.
mask-length	(Optional) The length of the mask as a number in the range from 0 to 32. Prefixes longer than the specified mask length are displayed.
subnets	(Optional) Displays the subnet routes for the specified prefix.
network-address	(Optional) The IP address of a network in the BGP routing table.
mask	(Optional) The mask of the network address, in dotted decimal format.

Command Modes

Privileged EXEC

Command History

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

Usage Guidelines

Table 1 displays optional additional **show ip bgp** command keywords that can be configured with the **show ip bgp topology** command. Replace the *bgp-keyword* argument with the appropriate keyword from the table. For more details about each command in its **show ip bgp** *bgp-keyword* form, see the *Cisco IOS IP Routing Protocols Command Reference*, Release 12.2SR.

Table 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.
injected-paths	Displays all injected paths.
labels	Displays labels for IPv4 NLRI specific information.
neighbors	Displays details about TCP and BGP neighbor connections.
oer-paths	Displays all OER-managed path information.
paths [*regexp*]	Displays autonomous system path information. If the optional *regexp* argument is entered, the autonomous system paths that are displayed match the autonomous system path regular expression.
peer-group	Displays information about peer groups.
pending-prefixes	Displays prefixes that are pending deletion.
prefix-list	Displays routes that match a specified prefix list.
quote-regexp	Displays routes that match the quoted autonomous system path regular expression.
regexp	Displays routes that match the autonomous system path regular expression.
replication	Displays the replication status update groups.
rib-failure	Displays bgp routes that failed to install in the routing table (RIB).
route-map	Displays routes matching the specified route map.
summary	Displays a summary of BGP neighbor status.
template	Displays peer-policy or peer-session templates.
update-group	Displays information on update groups.

Examples

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

```
Router# show ip bgp topology VIDEO summary

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

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

Table 2 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 router has received from a neighbor or peer group. When the maximum number (as set by the **neighbor maximum-prefix** command) is reached, the string “PfxRcd” appears in the entry, the neighbor is shut down, and the connection is Idle. An (Admin) entry with Idle status indicates that the connection has been shut down using the **neighbor shutdown** command.

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

```
Router# show ip bgp topology VIDEO neighbors

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

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

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

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

Table 3 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 router.
remote router ID	IP address of the neighbor.
BGP state	Finite state machine (FSM) stage of session negotiation.
up for	Time, in hh:mm:ss, for which the underlying TCP connection has been in existence.
Last read	Time, in hh:mm:ss, since BGP last received a message from this neighbor.

Table 3 show ip bgp topology neighbors Field Descriptions (continued)

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

Table 3 show ip bgp topology neighbors Field Descriptions (continued)

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

Related Commands

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

topology (BGP)

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

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

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

Syntax Description

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

Command Default

No default behavior or values

Command Modes

Router scope address family configuration

Command Historyt

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

Usage Guidelines

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

Examples

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

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

Related Commands

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

Feature Information for BGP Support for MTR

Table 4 lists the release history for this feature.

Not all commands may be available in your Cisco IOS software release. For release information about a specific command, see the command reference documentation.

Use Cisco Feature Navigator to find information about platform support and software image support. Cisco Feature Navigator enables you to determine which Cisco IOS and Catalyst OS software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to http://www.cisco.com/go/cfn. An account on Cisco.com is not required.

Note Table 4 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 4 Feature Information for BGP Support for Multi-Topology Routing

Feature Name	Releases	Feature Information
BGP Support for MTR	12.2(33)SRB	BGP support for MTR introduces a new configuration hierarchy and command-line interface (CLI) commands to support multi-topology routing (MTR) topologies. The new configuration hierarchy, or scope, can be implemented by BGP independently of MTR. MTR allows the configuration of service differentiation through class-based forwarding. MTR supports multiple unicast topologies and a separate multicast topology. A topology is a subset of the underlying network (or base topology) characterized by an independent set of Network Layer Reachability Information (NLRI). In 12.2(33)SRB, this feature was introduced on the Cisco 7600. The following commands were introduced or modified by this feature: **address-family ipv4 (BGP)**, **bgp tid**, **clear ip bgp topology**, **import topology**, **neighbor translate-topology**, **neighbor transport**, **scope**, **show ip bgp topology**, **topology (BGP).**

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