mGRE Tunnel Support over IPv6

The mGRE Tunnel Support over IPv6 feature enables service providers to deploy IPv6 in their core infrastructure.

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Finding Feature Information

Your software release may not support all the features documented in this module. For the latest caveats and feature information, see Bug Search Tool and the release notes for your platform and software release. To find information about the features documented in this module, and to see a list of the releases in which each feature is supported, see the feature information table.

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

Information About mGRE Tunnel Support over IPv6

mGRE Support over IPv6

Multiple sites of a Dynamic Multipoint Virtual Private Network (DMVPN) are interconnected by IPv6. A single logical multipoint generic routing encapsulation (mGRE) tunnel interface interconnects one VPN site to another. An IPv6 subnet connects a tunnel interface with other tunnel interfaces from various VPN sites. All tunnel interfaces connecting VPN sites act as hosts on the logical IPv6 subnet. This structure is referred to as the tunnel overlay network.

To enable service providers deploy IPv6 in their core infrastructure, mGRE tunnels over IPv6 are supported. DMVPN customers may run either IPv4 or IPv6 in their local networks, so the overlay endpoints can be either IPv4 or IPv6. For an IPv6 transport endpoint, the overlay endpoint can either be an IPv4 or IPv6 private network address.

GRE has a protocol field that identifies the passenger protocol. GRE tunnels allow Intermediate System-to-Intermediate System (IS-IS) or IPv6 to be specified as a passenger protocol, which allows both IS-IS and IPv6 traffic to run over the same tunnel. If GRE did not have a protocol field, it would be impossible to distinguish whether the tunnel was carrying IS-IS or IPv6 packets.

How to Configure mGRE Tunnel Support over IPv6

Configuring mGRE Tunnel Support over IPv6

Perform this task on the hub and spoke device of the multipoint generic routing encapsulation (mGRE) tunnel.

Before you begin

Create a Next Hop Resolution Protocol (NHRP) ID to configure on a multipoint generic routing encapsulation (mGRE) tunnel.

For more information on configuring NHRP, see the "How to Configure NHRP" topic in the *IP Addressing : NHRP Configuration Guide*.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ipv6 unicast-routing**
4. **interface tunnel** *tunnel-number*
5. **description** *description-string*
6. **ipv6 address** *ip-address mask*
7. **ipv6 nhrp map mulitcast dynamic**
8. **ipv6 nhrp network-id** *network-id*
9. **ipv6 nhrp holdtime** *seconds*
10. **ipv6 nhrp nhs** *ipv6- nhs-address*
11. **tunnel source** *ip-address* | *ipv6-address* | *interface-type* | *interface-number*
12. **tunnel mode gre multipoint ipv6**
13. **end**

DETAILED STEPS

Procedure

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

	Command or Action	Purpose
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**ipv6 unicast-routing** **Example:** `Device(config)# ipv6 unicast-routing`	Enables forwarding of IPv6 unicast datagrams.
Step 4	**interface tunnel** *tunnel-number* **Example:** `Device(config)# interface tunnel 1`	Configures a tunnel interface and enters interface configuration mode. • The *tunnel-number* argument specifies the number of tunnel interfaces that you can create or configure. There is no limit on the number of tunnel interfaces that you can configure.
Step 5	**description** *description-string* **Example:** `Device(config-if)# description DMVPN HUB`	Configures information specific to the interface.
Step 6	**ipv6 address** *ip-address mask* **Example:** `Device(config-if)# ipv6 address 2001:0DB8:0C18:2::300/64`	Specifies the IPv6 address and mask of the hub.
Step 7	**ipv6 nhrp map mulitcast dynamic** **Example:** `Device(config-if)# ipv6 nhrp map multicast dynamic`	Enables NHRP to initiate multipoint GRE tunnels to register their unicast NHRP mappings.
Step 8	**ipv6 nhrp network-id** *network-id* **Example:** `Device(config-if)# ipv6 nhrp network-id 100`	Configures NHRP on an interface. The IPv6 NHRP network-id is a unique 32-bit network identifier from a nonbroadcast multiaccess (NBMA) network. The range is from 1 to 4294967295.
Step 9	**ipv6 nhrp holdtime** *seconds* **Example:** `Device(config-if)# ipv6 nhrp holdtime 100`	Configures the time in seconds that NBMA addresses are advertised as valid in NHRP response.
Step 10	**ipv6 nhrp nhs** *ipv6- nhs-address* **Example:** `Device(config-if)# ipv6 nhrp nhs 1101:1::1`	Specifies IPv6 prefix of one or more NHRP servers.
Step 11	**tunnel source** *ip-address* | *ipv6-address* | *interface-type* | *interface-number* **Example:** `Device(config-if)# tunnel source ethernet 0`	Configures the source address of a tunnel interface.

	Command or Action	Purpose
Step 12	**tunnel mode gre multipoint ipv6** **Example:** `Device(config-if)# tunnel mode gre multipoint ipv6`	Sets the encapsulation mode of the tunnel to mGRE IPv6.
Step 13	**end** **Example:** `Device(config-if)# end`	Exits to global configuration mode.

What to do next

Verify the mGRE tunnel over IPv6.

Verifying mGRE Tunnel Support over IPv6

The **show** commands can be entered in any order.

Before you begin

Configure mGRE tunnel over IPv6.

SUMMARY STEPS

1. **show interface tunnel** *tunnel-interface*
2. **show tunnel endpoints tunnel** *tunnel-interface*
3. **show ipv6 traffic**

DETAILED STEPS

Procedure

Step 1 **show interface tunnel** *tunnel-interface*

This command displays information about the tunnel.

Example:

```
Device# show interface tunnel 1

Tunnel1 is up, line protocol is down
Hardware is Tunnel
Description: DMVPN Spoke 1
MTU 1456 bytes, BW 100 Kbit/sec, DLY 50000 usec,
reliability 255/255, txload 1/255, rxload 1/255
Encapsulation TUNNEL, loopback not set
Keepalive not set
Tunnel linestate evaluation down - transport reg down
Tunnel source Ethernet1/0
Tunnel Subblocks:
src-track:
Tunnel1 source tracking subblock associated with Ethernet1/0
```

```
Set of tunnels with source Ethernet1/0, 1 member (includes iterators), on interface <OK>
Tunnel protocol/transport multi-GRE/IPv6
Key disabled, sequencing disabled
Checksumming of packets disabled
Tunnel TTL 255
Tunnel transport MTU 1456 bytes
Tunnel transmit bandwidth 8000 (kbps)
Tunnel receive bandwidth 8000 (kbps)
Last input never, output never, output hang never
```

Step 2 **show tunnel endpoints tunnel** *tunnel-interface*

This command displays tunnel interface endpoints and verifies if the tunnel is created correctly.

Example:

```
Device# show tunnel endpoints tunnel 1

Tunnel 1 running in multi-GRE/IPv6 mode
Endpoint transport 1101:2::1 Refcount 3 Base 0x2B83A87F83D8 Create Time 00:22:05
overlay 1101:1::1 Refcount 2 Parent 0x2B83A87F83D8 Create Time 00:22:05
Tunnel Subblocks:
tunnel-nhrp-sb:
NHRP subblock has 1 entries
```

Step 3 **show ipv6 traffic**

This command displays statistics about IPv6 traffic on a tunnel.

Example:

```
Device# show ipv6 traffic

IPv6 statistics:
        Rcvd:  46 total, 34 local destination
               0 source-routed, 0 truncated
               0 format errors, 0 hop count exceeded
               0 bad header, 0 unknown option, 0 bad source
               0 unknown protocol, 0 not a router
               0 fragments, 0 total reassembled
               0 reassembly timeouts, 0 reassembly failures
        Sent:  54 generated, 0 forwarded
               0 fragmented into 0 fragments, 0 failed
               8 encapsulation failed, 0 no route, 0 too big
               0 RPF drops, 0 RPF suppressed drops
        Mcast: 22 received, 21 sent

ICMP statistics:
        Rcvd: 37 input, 0 checksum errors, 0 too short
              0 unknown info type, 0 unknown error type
              unreach: 0 routing, 0 admin, 0 neighbor, 0 address, 0 port
                       0 sa policy, 0 reject route
              parameter: 0 error, 0 header, 0 option
              0 hopcount expired, 0 reassembly timeout,0 too big
              0 bad embedded ipv6
              10 echo request, 0 echo reply
              0 group query, 0 group report, 0 group reduce
              0 router solicit, 7 router advert, 0 redirects
              4 neighbor solicit, 6 neighbor advert
        Sent: 47 output, 0 rate-limited
              unreach: 0 routing, 0 admin, 0 neighbor, 0 address, 0 port
                       0 sa policy, 0 reject route
```

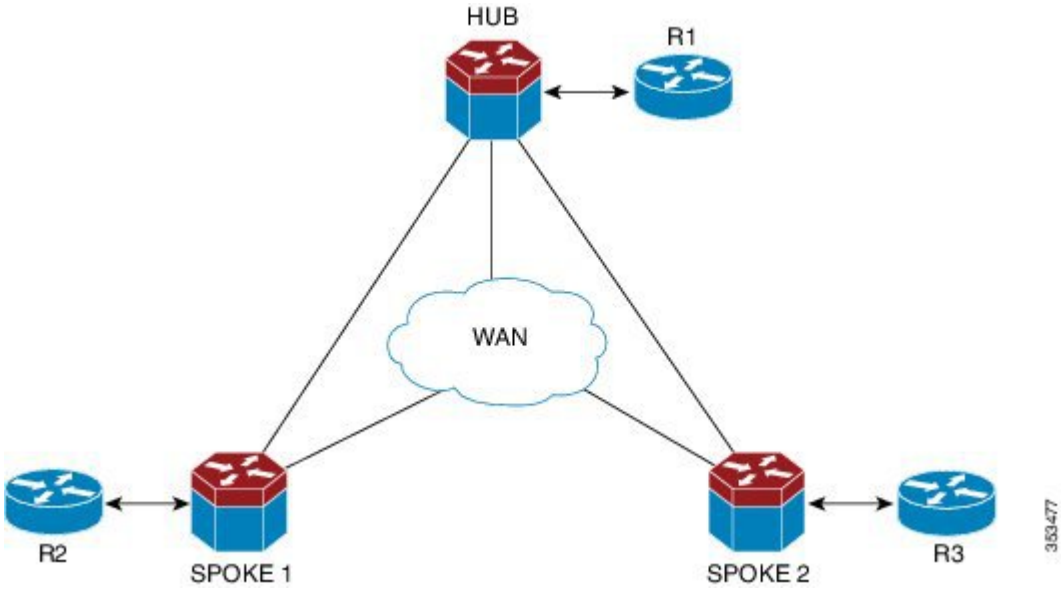
```
                parameter: 0 error, 0 header, 0 option
                0 hopcount expired, 0 reassembly timeout,0 too big
                0 echo request, 10 echo reply
                0 group query, 0 group report, 0 group reduce
                3 router solicit, 7 router advert, 0 redirects
                6 neighbor solicit, 6 neighbor advert

UDP statistics:
  Rcvd: 0 input, 0 checksum errors, 0 length errors
        0 no port, 0 dropped
  Sent: 0 output

TCP statistics:
  Rcvd: 0 input, 0 checksum errors
  Sent: 0 output, 0 retransmitted
```

Configuration Example for mGRE Tunnel over IPv6

Example for mGRE Tunnel over IPv6

mGRE Tunnel over IPv6

Configuring mGRE tunnel over IPv6 transport.




```
! Configure the topology

R1(config)# ipv6 unicast-routing
R1(config)# ipv6 cef
R1(config)# interface Ethernet0/1
R1(config-if)# ipv6 address 2001:DB8:1111:1111::1/64
R1(config-if)# no shutdown
R1(config-if)# exit
```

```
R1(config)# ipv6 route ::/0 2001:DB8:1111:1111::2

! Configure the tunnel interface on hub

Hub(config)# ipv6 unicast-routing
Hub(config)# interface tunnel 1
Hub(config-if)# description DMVPN HUB
Hub(config-if)# ipv6 address 2001:DB8:1111:4444::1/64
Hub(config-if)# ipv6 nhrp map multicast dynamic
Hub(config-if)# ipv6 nhrp network-id 100
Hub(config-if)# ipv6 nhrp holdtime 100
Hub(config-if)# tunnel source Ethernet0/1
Hub(config-if)# tunnel mode gre multipoint ipv6

! Configure the physical interface on the hub

Hub(config)# ipv6 unicast-routing
Hub(config)# interface Ethernet0/0
Hub(config-if)# ipv6 address 2001:DB8:1111:2222::1/64
Hub(config-if)# no shutdown
Hub(config-if)# exit
Hub(config)# ipv6 route ::/0 2001:DB8:1111:2222::2


! Configure the tunnel interface on spoke

Spoke1(config)# ipv6 unicast-routing
Spoke1(config)# interface tunnel 1
Spoke1(config-if)# description DMVPN Spoke 1
Spoke1(config-if)# ipv6 address 2001:DB8:1111:4444::2/64
Spoke1(config-if)# ipv6 nhrp map multicast dynamic
Spoke1(config-if)# ipv6 nhrp map 2001:DB8:1111:4444::1/64 2001:DB8:1111:3333::1
Spoke1(config-if)# ipv6 nhrp map multicast 2001:DB8:1111:3333::1
Spoke1(config-if)# ipv6 nhrp network-id 100
Spoke1(config-if)# ipv6 nhrp holdtime 100
Spoke1(config-if)# ipv6 nhrp nhs 2001:DB8:1111:4444::1
Spoke1(config-if)# tunnel source Ethernet0/0
Spoke1(config-if)# tunnel mode gre multipoint ipv6

! Configure the physical interface on the spoke

Spoke1(config)# interface Ethernet0/0
Spoke1(config-if)# ipv6 address 2001:DB8:1111:2222::2/64
Spoke1(config-if)# exit

! Configure the R2 device at the spoke

R2(config)# interface Ethernet0/1
R2(config-if)# ipv6 address 2001:DB8:1111:3333::1/64
R2(config-if)# no shutdown
R2(config-if)# exit
R2(config)# ipv6 route 2001:DB8:1111:1111::/64 2001:DB8:1111:2222::1
```

Additional References

Related Documents

Related Topic	Document Title
IPv6 addressing and connectivity	*IPv6 Configuration Guide*
Cisco IOS commands	Cisco IOS Master Command List, All Releases
IPv6 commands	Cisco IOS IPv6 Command Reference
Cisco IOS IPv6 features	Cisco IOS IPv6 Feature Mapping

Standards and RFCs

Standard/RFC	Title
RFCs for IPv6	*IPv6 RFCs*

MIBs

MIB	MIBs Link
	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*

Technical Assistance

Description	Link
The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password.	*http://www.cisco.com/cisco/web/support/index.html*

Feature Information for mGRE Tunnel Support over IPv6

The following table provides release information about the feature or features described in this module. This table lists only the software release that introduced support for a given feature in a given software release train. Unless noted otherwise, subsequent releases of that software release train also support that feature.

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Table 1: Feature Information for mGRE Tunnel Support over IPv6

Feature Name	Releases	Feature Information
mGRE Tunnel Support over IPv6	15.2(1)T XE Release 3.8S	mGRE tunnels are configured to enable service providers deploy IPv6 in their core infrastructure.