EIGRP OTP VRF Support

The EIGRP OTP VRF support feature extends VPN routing and forwarding (VRF) support to the EIGRP OTP feature thereby retaining and carrying VRF information over WAN.

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Prerequisites for EIGRP OTP VRF Support

The EIGRP Over the Top feature must be configured.

Restrictions for EIGRP OTP VRF Support

- The WAN facing interface should not be in VRF.

Information About EIGRP OTP VRF Support

Overview of EIGRP OTP VRF Support

The EIGRP Over the Top is a WAN solution with EIGRP in control plane and LISP in data plane, in which route distribution between two EIGRP customer-edge devices is performed using EIGRP protocol. LISP encapsulates the data that is sent over WAN. To support VRF functionality, the routes from each VRF must be carried over the control plane and installed in the correct VRF tables in the CE devices and EIGRP Route Reflector (E-RR).

How EIGRP OTP VRF Support Works

A CE device supports multiple VRFs on a LAN. On a WAN, the WAN interface in the default VRF and the CE device forms a remote EIGRP neighborship with another CE or E-RR device. The neighbors are formed in a single EIGRP process. One EIGRP process handles multiple, distinct neighbor formations in various VRFs on the LAN side and at the same time, also forms a neighbor on the WAN side with an OTP peer. The receiving peer picks routes that are applicable for the topologies that are present on the receiving peer. Routes from any other topologies are dropped.

Various routes learnt from peers in different VRFs are updated in the respective topologies on the CE and are transported to the OTP peer with the topology information for each route. Each topology represents a configured VRF on the device.

Each topology is associated with a unique ID, called the TID (Topology ID). The TID identifies the topology across various remote customer sites as the VRF name could be different on each CE device. For the CE devices to exchange the right information, the TID must be the same on all CEs.

The LISP Id (LISP Instance ID) also is mapped to a VRF and TID. As LISP carries different VRF packets using different virtual LISP interfaces, the LISP ID per VRF must be unique and must be same across the CE devices for packet delivery.

Use the **topology** command to configure a unique topology ID on customer site.

Data Encapsulation

Data encapsulation is achieved using LISP and is configured using the same **topology** command. Each VRF is associated with a LISP virtual interface. Data packets from one VRF will be encapsulated between the CE devices per VRF.

Each CE device is the edge device for a customer site, having various VRFs in a network. When customer sites connect via EIGRP OTP, each CE device is a neighbor to another CE device. In case of E-RR deployment, the CE s neighbors with the E-RR. The routes in a VRF in one customer site are carried to its peer and updated in the appropriate peer VRF table. If routes are received from a particular topology is absent in a peer, the peer drops the routes.

The E-RR reflects all topologies that are configured on the E-RR. Routes from topologies that are absent on the E-RR are not reflected. This is the reason that the E-RR is expected to have a super set of all VRFs present in the network.

Interfaces and Topology Command

When the **topology** command is used, all the interfaces under that VRF are enabled with EIGRP, thereby forming neighbors on all interfaces under a VRF. However, there may be interfaces on which EIGRP should not be enabled. To disable the formation of peers on such interfaces, use the **topo-interface** command and disable the interface on which EIGRP must not be enabled via **passive-interface** command.

Differences between EIGRP OTP Feature and EIGRP OTP VRF Support Feature

Table 1: EIGRP OTP Feature and EIGRP VRF Support Feature Differences

EIGRP OTP Feature	EIGRP OTP VRF Support Feature
Supports the default VRF only.	Multiple VRFs can be configured. Each VRF is considered as a topology and the topology related information is carried across associated with a TID (topology ID).
Neighbors are formed on only those interfaces that are configured with the **network** command.	Neighbors are formed across all interfaces in a particular VRF configured with the **topology** command.
The **network** command is required on the WAN interface to form an OTP neighbor.	The **network** command is not required.

How to Configure EIGRP OTP VRF Support

Configuring EIGRP OTP VRF Support on a CE Device

You must enable the EIGRP OTP VRF Support feature on all customer edge (CE) devices in the network so that the CEs know how to reach the Enhanced Interior Gateway Routing Protocol (EIGRP) Route Reflector configured in the network. Perform the following task to configure the EIGRP OTP VRF Support feature on a CE device.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router eigrp** *virtual-name*
4. **address-family ipv4 autonomous-system** *as-number*
5. **topology vrf** *vrf-name* **tid** *number* **lisp-instance-id** *number*
6. **topo-interface** *interface-name interface-number*
7. **passive-interface**
8. **exit**
9. **exit**
10. **neighbor**{*ip-address* | *ipv6-address*} *interface-type interface-number* [**remote** [**lisp-encap** [*lisp-id*]]]
11. **end**
12. **show ip eigrp topology**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. Enter your password, if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router eigrp** *virtual-name* **Example:** `Device(config)# router eigrp test`	Configures an EIGRP routing process and enters router configuration mode.
Step 4	**address-family ipv4 autonomous-system** *as-number* **Example:** `Device(config-router)# address-family ipv4 autonomous-system 10`	Enters address family configuration mode and configures an EIGRP routing instance.
Step 5	**topology vrf** *vrf-name* **tid** *number* **lisp-instance-id** *number* **Example:** `Device(config-router-af)# topology vrf vrf1 tid 10 lisp-instance-id 122`	Enters address-family topology configuration mode and assigns a topology to a VRF.
Step 6	**topo-interface** *interface-name interface-number* **Example:** `Device(config-router-af-topology)# #topo-interface GigabitEthernet0/0/0`	(Optional) Enters address family interface configuration mode and the interface on which EIGRP must not be enabled.
Step 7	**passive-interface** **Example:** `Device(config-router-af-topology-interface)# passive-interface`	Makes the interface passive.
Step 8	**exit** **Example:** `Device(config-router-af-topology-interface)# exit`	Exits address family interface configuration mode and returns to address-family topology configuration mode.
Step 9	**exit** **Example:** `Device(config-router-af-topology)# exit`	Exits address-family topology configuration mode and returns to address family configuration mode.

	Command or Action	Purpose
Step 10	**neighbor** {*ip-address* | *ipv6-address*} *interface-type interface-number* [**remote** [**lisp-encap** [*lisp-id*]]] **Example:** `Device(config-router-af)# neighbor 10.0.0.1 ATM0/3/0 remote lisp-encap 122`	Defines a neighboring device with which an EIGRP device can exchange routing information.
Step 11	**end** **Example:** `Device(config-router-af)# end`	Exits address family configuration mode and returns to privileged EXEC mode.
Step 12	**show ip eigrp topology** **Example:** `Router# show ip eigrp topology`	Displays EIGRP topology table entries.

Example

The following is a sample output from the show ip eigrp topology command.

```
Device# show ip eigrp topology

EIGRP-IPv4 VR(otp) Topology Table for AS(1)/ID(10.0.0.11)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status
P 10.0.0.1/24, 1 successors, FD is 131072000
        via Connected, Ethernet0/1
EIGRP-IPv4 VR(otp) Topology Table for AS(1)/ID(10.0.0.11)
           Topology(red) TID(20) VRF(red)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status
P 10.0.0.4/24, 1 successors, FD is 12161609142
        via 10.0.0.11 (12161609142/12096073142), Ethernet0/1
P 1.11.11.11/32, 1 successors, FD is 12161691062
        via 10.0.0.11 (12161691062/12096155062), Ethernet0/1
P 10.0.0.11/24, 1 successors, FD is 131072000
        via Connected, Ethernet0/0
P 10.1.1.1/32, 1 successors, FD is 131153920
        via 10.0.0.10 (131153920/163840), Ethernet0/0
EIGRP-IPv4 VR(otp) Topology Table for AS(1)/ID(10.0.0.11)
           Topology(green) TID(30) VRF(green)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status
P 10.222.222.222/32, 1 successors, FD is 12161691062
        via 10.0.0.11 (12161691062/12096155062), Ethernet0/1
P 10.0.0.7/24, 1 successors, FD is 131072000
        via Connected, Ethernet0/2
P 10.0.0.6/24, 1 successors, FD is 12161609142
        via 10.0.0.11 (12161609142/12096073142), Ethernet0/1
P 11.22.11.22/32, 1 successors, FD is 12161691062
        via 10.0.0.11 (12161691062/12096155062), Ethernet0/1
P 10.2.2.2/32, 1 successors, FD is 131153920
        via 10.0.0.12 (131153920/163840), Ethernet0/2
P 10.0.0.12/24, 1 successors, FD is 12161609142
        via 10.0.0.11 (12161609142/12096073142), Ethernet0/1
P 10.22.22.22/32, 1 successors, FD is 12161691062
        via 10.0.0.11 (12161691062/12096155062), Ethernet0/1
```

```
EIGRP-IPv4 VR(otp) Topology Table for AS(1)/ID(10.0.0.11)
           Topology(blue) TID(40) VRF(blue)
Codes: P - Passive, A - Active, U - Update, Q - Query, R - Reply,
       r - reply Status, s - sia Status
P 10.0.0.9/24, 1 successors, FD is 131072000
        via Connected, Ethernet0/3
P 10.0.0.8/24, 1 successors, FD is 12161609142
        via 10.0.0.11 (12161609142/12096073142), Ethernet0/1
P 3.33.33.33/32, 1 successors, FD is 12161691062
        via 10.0.0.11 (12161691062/12096155062), Ethernet0/1
P 10.3.3.3/32, 1 successors, FD is 131153920
        via 10.0.0.10 (131153920/163840), Ethernet0/3
```

Configuring EIGRP OTP VRF Support on EIGRP Route Reflectors

Perform this task to configure a customer edge (CE) device in a network to function as an Enhanced Interior Gateway Routing Protocol (EIGRP) Route Reflector.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **router eigrp** *virtual-name*
4. **address-family ipv4 autonomous-system** *as-number*
5. **topology vrf** *vrf-name* **tid** *number* **lisp-instance-id** *number*
6. **exit**
7. **remote-neighbors source** *interface-type interface-number* **unicast-listen lisp-encap** *LISP-instance-ID*
8. **end**

DETAILED STEPS

Procedure

	Command or Action	Purpose
Step 1	**enable** **Example:** `Device> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Device# configure terminal`	Enters global configuration mode.
Step 3	**router eigrp** *virtual-name* **Example:** `Device(config)# router eigrp test`	Configures an EIGRP routing process and enters router configuration mode.

	Command or Action	Purpose
Step 4	**address-family ipv4 autonomous-system** *as-number* **Example:** `Device(config-router)# address-family ipv4 autonomous-system 10`	Enters address family configuration mode and configures an EIGRP routing instance.
Step 5	**topology vrf** *vrf-name* **tid** *number* **lisp-instance-id** *number* **Example:** `Device((config-router-af)# topology vrf vrf1 tid 10 lisp-instance-id 122`	Assigns a topology to a VRF and enters address-family topology configuration mode.
Step 6	**exit** **Example:** `Device((config-router-af-topology)# exit`	Exits address-family topology configuration mode and returns to address family configuration mode.
Step 7	**remote-neighbors source** *interface-type interface-number* **unicast-listen lisp-encap** *LISP-instance-ID* **Example:** `Device(config-router-af)# remote-neighbors source ATM0/3/0 unicast-listen lisp-encap 122`	Enables remote neighbors to accept inbound connections from any remote IP address.
Step 8	**end** **Example:** `Device(config-router-af)# end`	Exits address family configuration mode and returns to privileged EXEC mode.

Configuration Examples for EIGRP OTP VRF Support

Example: Configuring EIGRP OTP VRF Support on a CE Device

```
Router> enable
Router# configure terminal
Device(config)# router eigrp test
Device(config-router)# address-family ipv4 autonomous-system 10
Device((config-router-af)# topology vrf vrf1 tid 10 lisp-instance-id 122
Device(config-router-af-topology)# topo-interface GigabitEthernet0/0/0
Device(config-router-af-topology-interface)# passive-interface
Device(config-router-af-topology-interface)# exit
Device((config-router-af-topology)# exit
Device(config-router-af)# neighbor 10.0.0.1 ATM0/3/0 remote lisp-encap 122
Device(config-router-af)# end
```

Example: Configuring EIGRP OTP VRF Support on EIGRP Route Reflectors

```
Device> enable
Device# configure terminal
Device(config)# router eigrp test
Device(config-router)# address-family ipv4 autonomous-system 10
Device(config-router-af)# topology vrf vrf1 tid 10 lisp-instance-id 122
Device(config-router-af-topology)# exit
Device(config-router-af)# remote-neighbors source ATM0/3/0 unicast-listen lisp-encap 122
Device(config-router-af)# end
```

Additional References for EIGRP OTP VRF Support

Related Documents

Related Topic	Document Title
Cisco IOS commands	Command Reference Guides for Access and Edge Routers
IP Routing: EIGRP commands	Cisco IOS IP Routing: EIGRP Command Reference

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 Configuring EIGRP OTP VRF Support

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

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

Table 2: Feature Information for Configuring EIGRP OTP VRF Support

Feature Name	Releases	Feature Information
EIGRP OTP VRF Support	Cisco IOS XE Release 3.15S	The EIGRP OTP VRF support feature extends VPN routing and forwarding (VRF) support to the EIGRP OTP feature thereby retaining and carrying VRF information over WAN. The following commands were introduced or modified: **neighbors**, **remote-neighbors**, **show ip eigrp topology**, **show ip route vrf**, **topology**.