Configuring Generic Routing Encapsulation(GRE) Tunnel IP Source and Destination VRF Membership

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Restrictions for GRE Tunnel IP Source and Destination VRF Membership

- Both ends of the tunnel must reside within the same VRF.
- The VRF associated with the tunnel vrf command is the same as the VRF associated with the physical interface over which the tunnel sends packets (outer IP packet routing).
- The VRF associated with the tunnel by using the ip vrf forwarding command is the VRF that the packets are to be forwarded in as the packets exit the tunnel (inner IP packet routing).
- The feature does not support the fragmentation of multicast packets passing through a multicast tunnel.
- The feature does not support the ISIS (Intermediate System to intermediate system) protocol.
- The following restrictions are applicable on the Cisco Catalyst 9500X Series Switches:
  - A tunnel cannot be formed over an switched virtual interface (SVI).
  - Only 16 unique tunnel sources are supported.
  - OSPFv3 is not supported on GRE tunnels.
  - Each interface must be configured with a unique combination of tunnel source and destination.
  - BFD is not supported on GRE tunnels.

- GRE tunnels cannot be part of a routing protocol if it is formed over a Layer 3 VLAN Switch Virtual Interface (SVI).

- Keepalive is not supported on VRF aware GRE tunnels.

Information About GRE Tunnel IP Source and Destination VRF Membership

This feature allows you to configure the source and destination of a tunnel to belong to any Virtual Private Network (VPN) routing and forwarding (VRF) table. A VRF table stores routing data for each VPN. The VRF table defines the VPN membership of a customer site attached to the network access server (NAS). Each VRF table comprises an IP routing table, a derived Cisco Express Forwarding (CEF) table, and guidelines and routing protocol parameters that control the information that is included in the routing table.

Previously, GRE IP tunnels required the IP tunnel destination to be in the global routing table. The implementation of this feature allows you to configure a tunnel source and destination to belong to any VRF. As with existing GRE tunnels, the tunnel becomes disabled if no route to the tunnel destination is defined.

Note In a topology where Host1 → Switch1 → ISR → Switch2 → Host2, the Generic Routing Encapsulation (GRE) transit traffic passes between the two Catalyst 9000 Series Switches. When MACsec is enabled on the interconnect links through the next-hop device, such as an Integrated Services Router (ISR), the GRE traffic fails. To restore the GRE traffic delivery, disable the MACsec between Switch1 and the next-hop device.

How to Configure GRE Tunnel IP Source and Destination VRF Membership

Follow these steps to configure GRE Tunnel IP Source and Destination VRF Membership:

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	**interface tunnel***number* **Example:**	Enters interface configuration mode for the specified interface.

	Command or Action	Purpose
	`Device(config)#interface tunnel 0`	• *number* is the number associated with the tunnel interface.
Step 4	**ip vrf forwarding***vrf-name* **Example:** `Device(config-if)#ip vrf forwarding green`	Associates a virtual private network (VPN) routing and forwarding (VRF) instance with an interface or subinterface. • *vrf-name* is the name assigned to a VRF.
Step 5	**ip address***ip-address subnet-mask* **Example:** `Device(config-if)#ip address 10.7.7.7 255.255.255.255`	Specifies the interface IP address and subnet mask. • *ip-address* specifies the IP address of the interface. • *subnet-mask* specifies the subnet mask of the interface.
Step 6	**tunnel source** {*ip-address* | *type number*} **Example:** `Device(config-if)#tunnel source loop 0`	Specifies the source of the tunnel interface. • *ip-address* specifies the IP address to use as the source address for packets in the tunnel. • *type* specifies the interface type (for example, serial). • *number* specifies the port, connector, or interface card number. The numbers are assigned at the factory at the time of installation or when added to a system, and can be displayed using the show interfaces command.
Step 7	**tunnel destination** {*hostname* | *ip-address*} **Example:** `Device(config-if)#tunnel destination 10.5.5.5`	Defines the tunnel destination. • *hostname* specifies the name of the host destination. • *ip-address* specifies the IP address of the host destination.
Step 8	**tunnel vrf***vrf-name* **Example:** `Device(config-if)#tunnel vrf finance1`	Associates a VPN routing and forwarding (VRF) instance with a specific tunnel destination. • *vrf-name* is the name assigned to a VRF.

Configuration Example for GRE Tunnel IP Source and Destination VRF Membership

In this example, packets received on interface e0 using VRF green are forwarded out of the tunnel through interface e1 using VRF blue.

```
ip vrf blue rd 1:1

ip vrf green rd 1:2

interface loop0
ip vrf forwarding blue
ip address 10.7.7.7 255.255.255.255

interface tunnel0
ip vrf forwarding green
ip address 10.3.3.3 255.255.255.0 tunnel source loop 0
tunnel destination 10.5.5.5 tunnel vrf blue

interface ethernet0
ip vrf forwarding green
ip address 10.1.1.1 255.255.255.0

interface ethernet1
ip vrf forwarding blue
ip address 10.2.2.2 255.255.255.0

ip route vrf blue 10.5.5.5 255.255.255.0 ethernet 1
```

Additional References

Table 1: Related Documents

Related Topic	Document Title
VRF tables	"Configuring Multiprotocol Label Switching" chapter of the Cisco IOS Switching Services Configuration Guide, Release 12.2
Tunnels	Cisco IOS Interface Configuration Guide, Release 12.2

Feature History for Generic Routing Encapsulation Tunnel IP Source and Destination VRF Membership

This table provides release and related information for the features explained in this module.

These features are available in all the releases subsequent to the one they were introduced in, unless noted otherwise.

Release	Feature	Feature Information
Cisco IOS XE Everest 16.5.1a	Generic Routing Encapsulation(GRE) Tunnel IP Source and Destination VRF Membership	GRE Tunnel IP Source and Destination VRF Membership feature allows you to configure the source and destination of a tunnel to belong to any VPN VRF table. Support for this feature was introduced on the C9500-12Q, C9500-16X, C9500-24Q, C9500-40X models of the Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Fuji 16.8.1a	Generic Routing Encapsulation(GRE) Tunnel IP Source and Destination VRF Membership	Support for this feature was introduced on the C9500-32C, C9500-32QC, C9500-48Y4C, and C9500-24Y4C models of the Cisco Catalyst 9500 Series Switches.
Cisco IOS XE Cupertino 17.7.1	Generic Routing Encapsulation(GRE) Tunnel IP Source and Destination VRF Membership	This feature was implemented on the C9500X-28C8D model.
Cisco IOS XE Dublin 17.10.1b	Generic Routing Encapsulation(GRE) Tunnel IP Source and Destination VRF Membership	This feature was implemented on the C9500X-60L4D model.

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