

# **OSPF Support for Multi-VRF on CE Routers**

The OSPF Support for Multi-VRF on CE Routers feature provides the capability of suppressing provider edge (PE) checks that are needed to prevent loops when the PE is performing a mutual redistribution of packets between the OSPF and BGP protocols. When VPN routing and forward (VRF) is used on a router that is not a PE (that is, one that is not running BGP), the checks can be turned off to allow for correct population of the VRF routing table with routes to IP prefixes.

OSPF multi-VRF allows you to split the router into multiple virtual routers, where each router contains its own set of interfaces, routing table, and forwarding table.

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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 <a href="https://www.cisco.com/go/cfn">www.cisco.com/go/cfn</a>. An account on Cisco.com is not required.

# Information About OSPF Support for Multi-VRF on CE Routers

The OSPF Support for Multi-VRF on CE Routers feature provides the capability of suppressing provider edge (PE) checks that are needed to prevent loops when the PE is performing a mutual redistribution of packets between the OSPF and BGP protocols. When VPN routing and forward (VRF) is used on a router that is not a PE (that is, one that is not running BGP), the checks can be turned off to allow for correct population of the VRF routing table with routes to IP prefixes.

OSPF multi-VRF allows you to split the router into multiple virtual routers, where each router contains its own set of interfaces, routing table, and forwarding table. OSPF multi-VRF gives you the ability to segment parts of your network and configure those segments to perform specific functions, yet still maintain correct routing information.

# **How to Configure OSPF Support for Multi-VRF on CE Routers**

## **Configuring the Multi-VRF Capability for OSPF Routing**

## Before you begin

CEF must be running on the network.

### **SUMMARY STEPS**

- 1. enable
- 2. show ip ospf [process-id]
- 3. configure terminal
- **4.** router ospf process-id [vrf vpn-name]
- 5. capability vrf-lite

### **DETAILED STEPS**

nable  xample:  outer> enable  how ip ospf [process-id]  xample:	the router is connected to the VPN backbone, you can use
outer> enable how ip ospf [process-id]	• Enter your password if prompted.  Displays the status of the router. If the display indicates that the router is connected to the VPN backbone, you can use
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how ip ospf [process-id]	the router is connected to the VPN backbone, you can use
• • •	the router is connected to the VPN backbone, you can use
xample:	the router is connected to the VPN backbone, you can use the <b>capability vrf-lite</b> command to decouple the PE router
	± *
outer> show ip ospf 1	from the VPN backbone.
onfigure terminal	Enters global configuration mode.
xample:	
outer# configure terminal	
outer ospf process-id [vrf vpn-name]	Enables OSPF routing and enters router configuration mode.
xample:	• The <i>process-id</i> argument identifies the OSPF process.
outer(config)# router ospf 1 vrf grc	<ul> <li>Use the vrf keyword and vpn-name argument to identify a VPN.</li> </ul>
> 0	cample:  couter# configure terminal  couter ospf process-id [vrf vpn-name]  cample:

	Command or Action	Purpose
Step 5	capability vrf-lite	Applies the multi-VRF capability to the OSPF process.
	Example:	
	Router(config)# capability vrf-lite	

## **Verifying the OSPF Multi-VRF Configuration**

No specific **debug** or **show** commands are associated with this feature. You can verify the success of the OSPF multi-VRF configuration by using the **show ip ospf**[*process-id*] command to verify that the router is not connected to the VPN backbone.

This output from the **show ip ospf process** command indicates that the PE router is currently connected to the backbone.

```
Router# show ip ospf 12

Routing Process "ospf 12" with ID 151.1.1.1 and Domain ID 0.0.0.12
Supports only single TOS(TOS0) routes
Supports opaque LSA
Connected to MPLS VPN Superbackbone
SPF schedule delay 5 secs, Hold time between two SPFs 10 secs
Minimum LSA interval 5 secs. Minimum LSA arrival 1 secs
Number of external LSA 0. Checksum Sum 0x0
Number of opaque AS LSA 0. Checksum Sum 0x0
Number of Dobitless external and opaque AS LSA 0
Number of DonotAge external and opaque AS LSA 0
Number of areas in this router is 0. 0 normal 0 stub 0 nssa
External flood list length 0
```

When the OSPF VRF process is configured with the **capability vrf-lite** command under the **router ospf** command, the "Connected to MPLS VPN Superbackbone" line will not be present in the display.

# Configuration Examples for OSPF Support for Multi-VRF on CE Routers

## **Example Configuring the Multi-VRF Capability**

This example shows a basic OSPF network with a VRF named grc configured. The **capability vrf-lite** command is entered to suppress the PE checks.

```
!
ip cef
ip vrf grc
   rd 1:1
interface Serial2/0
   ip vrf forwarding grc
   ip address 192.168.1.1 255.255.255.252
!
interface Serial3/0
   ip vrf forwarding grc
```

```
ip address 192.168.2.1 255.255.255.252
router ospf 9000 vrf grc
 log-adjacency-changes
  capability vrf-lite
  redistribute rip metric 1 subnets
 network 192.168.1.0 0.0.0.255 area 0
router rip
  address-family ipv4 vrf grc
  redistribute ospf 9000 vrf grc
 network 192.168.2.0
 no auto-summary
 end
Device# show ip route vrf grc
Routing Table: grc
Codes: C - connected, S - static, R - RIP, M - mobile, B - BGP
      D - EIGRP, EX - EIGRP external, O - OSPF, IA - OSPF inter area
      N1 - OSPF NSSA external type 1, N2 - OSPF NSSA external type 2
      E1 - OSPF external type 1, E2 - OSPF external type 2
       i - IS-IS, su - IS-IS summary, L1 - IS-IS level-1, L2 - IS-IS level-2
          - IS-IS inter area, * - candidate default, U - per-user static route
       o - ODR, P - periodic downloaded static route
Gateway of last resort is not set
O IA 192.168.192.0/24 [110/138] via 192.168.1.13, 00:06:08, Serial2/0
                      [110/138] via 192.168.1.9, 00:06:08, Serial3/0
O IA 192.168.242.0/24 [110/74] via 192.168.1.13, 00:06:08, Serial2/0
O IA 192.168.193.0/24 [110/148] via 192.168.1.13, 00:06:08, Serial2/0
                      [110/148] via 192.168.1.9, 00:06:08, Serial3/0
O IA 192.168.128.0/24 [110/74] via 192.168.1.9, 00:06:08, Serial3/0
O IA 192.168.129.0/24 [110/84] via 192.168.1.9, 00:06:08, Serial3/0
O IA 192.168.130.0/24 [110/84] via 192.168.1.9, 00:06:08, Serial3/0
     172.16.0.0/24 is subnetted, 2 subnets
        172.16.9.0 [110/5] via 192.168.1.13, 00:06:08, Serial2/0
        172.16.10.0 [110/5] via 192.168.1.13, 00:06:08, Serial2/0
O IA 192.168.131.0/24 [110/94] via 192.168.1.9, 00:06:20, Serial3/0
     192.168.1.0/30 is subnetted, 4 subnets
        192.168.1.8 is directly connected, Serial3/0
        192.168.1.12 is directly connected, Serial2/0
0
        192.168.1.0 [110/128] via 192.168.1.9, 00:06:20, Serial3/0
        192.168.1.4 [110/128] via 192.168.1.13, 00:06:20, Serial2/0
```

## **Example Verifying the OSPF Multi-VRF Configuration**

This example illustrates the output display from the **show ip ospf** command after OSPF multi-VRF has been configured on the router.

### Device# show ip ospf 9000

```
Routing Process "ospf 9000" with ID 10.0.0.1
Supports only single TOS(TOS0) routes
Supports opaque LSA
Supports Link-local Signaling (LLS)
Supports area transit capability
Supports NSSA (compatible with RFC 3101)
Event-log disabled
It is an autonomous system boundary router
Redistributing External Routes from,
   rip with metric mapped to 1, includes subnets in redistribution
Router is not originating router-LSAs with maximum metric
Initial SPF schedule delay 5000 msecs
```

```
Minimum hold time between two consecutive SPFs 10000 msecs
Maximum wait time between two consecutive SPFs 10000 msecs
Incremental-SPF disabled
Minimum LSA interval 5 secs
Minimum LSA arrival 1000 msecs
LSA group pacing timer 240 secs
Interface flood pacing timer 33 msecs
Retransmission pacing timer 66 msecs
Number of external LSA 0. Checksum Sum 0x000000
Number of opaque AS LSA 0. Checksum Sum 0x000000
Number of DCbitless external and opaque AS LSA 0
Number of DoNotAge external and opaque AS LSA 0
Number of areas in this router is 1. 1 normal 0 stub 0 nssa
Number of areas transit capable is 0
External flood list length 0
IETF NSF helper support enabled
Cisco NSF helper support enabled
Reference bandwidth unit is 100 mbps
  Area BACKBONE(0) (Inactive)
       Number of interfaces in this area is 1
       Area has no authentication
       SPF algorithm last executed 00:00:10.264 ago
       SPF algorithm executed 1 times
       Area ranges are
       Number of LSA 1. Checksum Sum 0x00B674
       Number of opaque link LSA 0. Checksum Sum 0x000000
       Number of DCbitless LSA 0
       Number of indication LSA 0
       Number of DoNotAge LSA 0
       Flood list length 0
```

## **Additional References**

## **Related Documents**

Related Topic	Document Title
Configuring OSPF	Configuring OSPF
Multiprotocol Label Switching (MPLS)	MPLS Multi-VRF (VRF Lite) Support

### **Standards**

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

#### **MIBs**

MIBs	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 software releases, and feature sets, use Cisco MIB Locator found at the following URL:  http://www.cisco.com/go/mibs

## **RFCs**

RFCs	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 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.	

# Feature Information for OSPF Support for Multi-VRF on CE Routers

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 OSPF Support for Multi-VRF on CE Routers

Feature Name	Releases	Feature Information
OSPF Support for Multi-VRF on CE Routers	12.0(21)ST 12.0(22)S 12.2(8)B 12.2(13)T 12.2(14)S	The OSPF Support for Multi-VRF on CE Routers feature provides the capability to suppress provider edge (PE) checks that are needed to prevent loops when the PE is performing a mutual redistribution of packets between the OSPF and BGP protocols. When VPN routing and forwarding (VRF) is used on a router that is not a PE (that is, one that is not running BGP), the checks can be turned off to allow for correct population of the VRF routing table with routes to IP prefixes.  The following commands are introduced or modified in the feature documented in this module:  • capability vrf-lite

# **Glossary**

**CE Router** --Customer Edge router, an edge router in the C network, defined as a C router which attaches directly to a P router.

C Network -- Customer (enterprise or service provider) network.

**C Router** -- Customer router, a router in the C network.

**LSA** --link-state advertisement . Broadcast packet used by link-state protocols that contains information about neighbors and path costs. LSAs are used by the receiving routers to maintain their routing tables.

**PE Router** --Provider Edge router, an edge router in the P network, defined as a P router which attaches directly to a C router.

P Network -- MPLS-capable service provider core network. P routers perform MPLS.

**P Router** -- Provider router, a router in the P network.

**SPF** --shortest path first. A routing algorithm that iterates on length of path to determine a shortest-path spanning tree.

**VPN** --Virtual Private Network. Enables IP traffic to travel securely over a public TCP/IP network by encrypting all traffic from one network to another.

VRF -- VPN Routing and Forwarding.

Glossary