OSPF Support for Multi-VRF on CE Routers

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.

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.

Information About OSPF Support for Multi-VRF on CE Routers

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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. **vpdn- group**   *name*
5. **exit**
6. **resource-pool profile vpdn**   *name*
7. **vpdn   group**   *name*
8. **vpn   vrf**   *vrf-name* | **id** *vpn-id*
9. **exit**
10. **router ospf**   *process-id* [**vrf** *vpn-name*]
11. **capability vrf-lite**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables higher privilege levels, such as privileged EXEC mode. • Enter your password if prompted.
Step 2	**show ip ospf** [*process-id* **Example:** `Router# show ip ospf 1`	Displays the status of the router. If the display indicates that the router is connected to the VPN backbone, you can use the **capability vrf-lite** command to decouple the PE router from the VPN backbone.
Step 3	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 4	**vpdn- group** *name* **Example:** `Router(config)# vpdn-group mygroup`	Creates a VPDN group.

	Command or Action	Purpose
Step 5	**exit** Example: `Router(config-vpdn)# exit`	Leaves the configuration mode and returns to global configuration mode.
Step 6	**resource-pool profile vpdn** *name* Example: `Router(config)# resource-pool profile vpdn company1`	Creates a virtual private dialup network (VPDN) profile and enters VPDN profile configuration mode.
Step 7	**vpdn group** *name* Example: `Router(config-vpdn-profile)# vpdn group mygroup`	Associates a virtual private dialup network (VPDN) group with a customer or VPDN profile.
Step 8	**vpn vrf** *vrf-name* | **id** *vpn-id* Example: `Router(config-vpdn)# vpn vrf grc`	Specifies that the source and destination IPv4 addresses of a given virtual private dialup network (VPDN) group belong to a specified Virtual Private Network (VPN) routing and forwarding (VRF) instance.
Step 9	**exit** Example: `Router(config-vpdn)# exit`	Leaves the configuration mode and returns to global configuration mode.
Step 10	**router ospf** *process-id* [**vrf** *vpn-name*] Example: `Router(config)# router ospf 1 vrf grc`	Enables OSPF routing and enters router configuration mode. • The *process-id* argument identifies the OSPF process. • Use the **vrf** keyword and *vpn-name* argument to identify a VPN.
Step 11	**capability vrf-lite** Example: `Router(config-router)# capability vrf-lite`	Applies the multi-VRF capability to the OSPF process.

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 172.16.1.1 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 DCbitless 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 Example 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 Serial2/0/0
 ip vrf forwarding grc
 ip address 192.168.1.1 255.255.255.252
!
interface Serial3/0/0
 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
          ia - 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, Serial2/0/0
                      [110/138] via 192.168.1.9, 00:06:08, Serial3/0/0
O IA 192.168.242.0/24 [110/74] via 192.168.1.13, 00:06:08, Serial2/0/0
O IA 192.168.193.0/24 [110/148] via 192.168.1.13, 00:06:08, Serial2/0/0
                      [110/148] via 192.168.1.9, 00:06:08, Serial3/0/0
O IA 192.168.128.0/24 [110/74] via 192.168.1.9, 00:06:08, Serial3/0/0
O IA 192.168.129.0/24 [110/84] via 192.168.1.9, 00:06:08, Serial3/0/0
O IA 192.168.130.0/24 [110/84] via 192.168.1.9, 00:06:08, Serial3/0/0
     172.16.0.0/24 is subnetted, 2 subnets
O E2    172.16.9.0 [110/5] via 192.168.1.13, 00:06:08, Serial2/0/0
O E2    172.16.10.0 [110/5] via 192.168.1.13, 00:06:08, Serial2/0/0
O IA 192.168.131.0/24 [110/94] via 192.168.1.9, 00:06:20, Serial3/0/0
     192.168.1.0/30 is subnetted, 4 subnets
C        192.168.1.8 is directly connected, Serial3/0/0
C        192.168.1.12 is directly connected, Serial2/0/0
O        192.168.1.0 [110/128] via 192.168.1.9, 00:06:20, Serial3/0/0
O        192.168.1.4 [110/128] via 192.168.1.13, 00:06:20, Serial2/0/0
```

Additional References

For additional information related to OSPF support for multi-VRF on CE routers, see the following references.

Related Documents

Related Topic	Document Title
Configuring OSPF	"Configuring OSPF"
Multiprotocol Label Switching (MPLS)	*Cisco IOS XE Multiprotocol Label Switching Configuration Guide, Release 2*
OSPF commands	*Cisco IOS IP Routing: OSPF Command Reference*
Cisco IOS master command list, all releases	Cisco IOS Master Command List, All Releases

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 XE software 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 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 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.

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.

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	Cisco IOS XE Release 2.1 Cisco IOS XE Release 3.1.0 SG	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**

Table 2: Feature Information for OSPF Support for Multi-VRF on CE Routers

Feature Name	Releases	Feature Information
OSPF Support for Multi-VRF on CE Routers	Cisco IOS XE Release 17.4	This feature was introduced.

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.