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.

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 OSPF Support for Multi-VRF on CE Routers

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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

	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	**router ospf** *process-id* [**vrf** *vpn-name*]	Enables OSPF routing and enters router configuration mode.

	Command or Action	Purpose
	Example: `Router(config)# router ospf 1 vrf grc`	• The *process-id* argument identifies the OSPF process. • Use the **vrf** keyword and *vpn-name* argument to identify a VPN.
Step 5	**capability vrf-lite** **Example:** `Router(config)# 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 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 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 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
       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
                      [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
O E2    172.16.9.0 [110/5] via 192.168.1.13, 00:06:08, Serial2/0
O E2    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
C       192.168.1.8 is directly connected, Serial3/0
C       192.168.1.12 is directly connected, Serial2/0
O       192.168.1.0 [110/128] via 192.168.1.9, 00:06:20, Serial3/0
O       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.	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	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.