



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.

Feature Specifications for the OSPF Support for Multi-VRF on CE Routers Feature

Feature History

Release	Modification
12.0(21)ST	This feature was introduced.
12.0(22)S	This feature was integrated into Cisco IOS Release 12.0(22)S.
12.2(8)B	This feature was integrated into Cisco IOS Release 12.2(8)B.
12.2(13)T	This feature was integrated into Cisco IOS Release 12.2(13)T.
12.2(14)S	This feature was integrated into Cisco IOS Release 12.2(14)S.

Supported Platforms

For information about platforms supported in Cisco IOS Release 12.0(21)ST, 12.0(22)S, 12.2(13)T, and 12.2(14)S, refer to Cisco Feature Navigator. Cisco Feature Navigator does not support Cisco IOS Release 12.2(8)B.

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To get updated information regarding platform support for this feature, access Cisco Feature Navigator. Cisco Feature Navigator dynamically updates the list of supported platforms as new platform support is added for the feature.

Cisco Feature Navigator is a web-based tool that enables you to determine which Cisco IOS software images support a specific set of features and which features are supported in a specific Cisco IOS image. You can search by feature or release. Under the release section, you can compare releases side by side to display both the features unique to each software release and the features in common.



To access Cisco Feature Navigator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

Cisco Feature Navigator is updated regularly when major Cisco IOS software releases and technology releases occur. For the most current information, go to the Cisco Feature Navigator home page at the following URL:

<http://www.cisco.com/go/fn>

Availability of Cisco IOS Software Images

Platform support for particular Cisco IOS software releases is dependent on the availability of the software images for those platforms. Software images for some platforms may be deferred, delayed, or changed without prior notice. For updated information about platform support and availability of software images for each Cisco IOS software release, refer to the online release notes or, if supported, Cisco Feature Navigator.

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Information About OSPF Support for Multi-VRF on CE Routers

Before you configure OSPF support for multi-VRF on CE routers, you should understand the following concepts:

- [Benefits of OSPF Multi-VRF Support, page 2](#)

Benefits of OSPF Multi-VRF Support

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

This section contains the following procedures:

- [Configuring the Multi-VRF Capability for OSPF Routing, page 3](#)
- [Verifying the OSPF Multi-VRF Configuration, page 4](#)

Configuring the Multi-VRF Capability for OSPF Routing

This section describes how to configure the multi-VRF for OSPF routing. This task assumes that you have already configured a VRF. For a complete VRF configuration example, see the “[Configuring the Multi-VRF Capability Example](#)” section on page 5.

Prerequisites

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 [<i>process-id</i>] 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.

	Command or Action	Purpose
Step 4	<pre>router ospf process-id [vrf vpn-name]</pre> <p>Example: Router(config)# router ospf 1 vrf grc</p>	<p>Enables OSPF routing and enters router configuration mode.</p> <ul style="list-style-type: none"> The <i>process-id</i> argument identifies the OSPF process. Use the vrf keyword and <i>vpn-name</i> argument to identify a VPN.
Step 5	<pre>capability vrf-lite</pre> <p>Example: Router(config)# capability vrf-lite</p>	<p>Applies the multi-VRF capability to the OSPF process.</p>

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

This section provides the following configuration examples:

- [Configuring the Multi-VRF Capability Example, page 5](#)
- [Verifying the OSPF Multi-VRF Configuration Example, page 6](#)

Configuring the Multi-VRF Capability Example

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 network 192.168.2.0
  no auto-summary
end
```

Router# **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
```

Verifying the OSPF Multi-VRF Configuration Example

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

```
Router# show ip ospf database external 172.16.0.0 self

      OSPF Router with ID (10.0.0.1) (Process ID 100)

      Type-5 AS External Link States

LS age: 175
Options: (No TOS-capability, DC)
LS Type: AS External Link
Link State ID: 172.16.0.0 (External Network Number )
Advertising Router: 10.0.0.1
LS Seq Number: 80000001
Checksum: 0xEA9E
Length: 36
Network Mask: /8
    Metric Type: 2 (Larger than any link state path)
    MTID: 0
    Metric: 20
    Forward Address: 0.0.0.0
    External Route Tag: 0
```

Additional References

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

Related Documents

Related Topic	Document Title
Configuring OSPF	<i>Cisco IOS IP Routing Protocols Configuration Guide</i>
Multiprotocol Label Switching (MPLS)	<i>Cisco IOS Switching Services Configuration Guide</i>

Standards

Standards ¹	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

1. Not all supported standards are listed.

MIBs

MIBs ¹	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 obtain lists of supported MIBs by platform and Cisco IOS release, and to download MIB modules, go to the Cisco MIB website on Cisco.com at the following URL: http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml

1. Not all supported MIBs are listed.

To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL:

<http://tools.cisco.com/ITDIT/MIBS/servlet/index>

If Cisco MIB Locator does not support the MIB information that you need, you can also obtain a list of supported MIBs and download MIBs from the Cisco MIBs page at the following URL:

<http://www.cisco.com/public/sw-center/netmgmt/cmtk/mibs.shtml>

To access Cisco MIB Locator, you must have an account on Cisco.com. If you have forgotten or lost your account information, send a blank e-mail to cco-locksmith@cisco.com. An automatic check will verify that your e-mail address is registered with Cisco.com. If the check is successful, account details with a new random password will be e-mailed to you. Qualified users can establish an account on Cisco.com by following the directions found at this URL:

<http://www.cisco.com/register>

RFCs

RFCs ¹	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

1. Not all supported RFCs are listed.

Technical Assistance

Description	Link
Technical Assistance Center (TAC) home page, containing 30,000 pages of searchable technical content, including links to products, technologies, solutions, technical tips, tools, and lots more. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/public/support/tac/home.shtml

Command Reference

The following commands are introduced or modified in the feature or features documented in this module. For information about these commands, see the *Cisco IOS IP Routing Protocols Command Reference* at http://www.cisco.com/en/US/docs/ios/iproute/command/reference/irp_book.html. For information about all Cisco IOS commands, go to the Command Lookup Tool at <http://tools.cisco.com/Support/CLILookup> or to the *Cisco IOS Master Commands List*.

- **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.

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