MPLS VPN ID

Feature History

Release	Modification
12.0(17)ST	This feature was introduced.
12.2(4)B	Support for this feature was integrated into Cisco IOS Release 12.2(4)B.
12.2(8)T	Support for this feature was integrated into Cisco IOS Release 12.2(8)T.
12.2(14)S	This feature was integrated into Cisco IOS Release 12.2(14)S.

This document describes the MPLS VPN ID feature and includes the following sections:

Feature Overview

Using Multiprotocol Label Switching (MPLS) VPN ID you can identify virtual private networks (VPNs) by a VPN identification number, as described in RFC 2685. This implementation of the MPLS VPN ID feature is used for identifying a VPN. The MPLS VPN ID feature is not used to control the distribution of routing information or to associate IP addresses with MPLS VPN ID numbers in routing updates.

Multiple VPNs can be configured in a router. You can use a VPN name (a unique ASCII string) to reference a specific VPN configured in the router. Alternately, you can use a VPN ID to identify a particular VPN in the router. The VPN ID follows a standard specification (RFC 2685). To ensure that the VPN has a consistent VPN ID, assign the same VPN ID to all the routers in the service provider network that services that VPN.

You can use several applications to manage VPNs by VPN ID. For more details on how server applications use the VPN ID, refer to the "Benefits" section on page 3.

Note Configuration of a VPN ID for a VPN is optional. You can still use a VPN name to identify configured VPNs in the router. The VPN name is not affected by the VPN ID configuration. These are two independent mechanisms to identify VPNs.

Virtual Route Forwarding (VRF)

For each VPN that is configured in a router, the router creates a VRF instance. The VPN ID is stored in the corresponding VRF structure for the VPN.

The VRF table is a key element in the MPLS VPN technology. VRF tables exist on provider edge (PE) routers only. More than one VRF table can exist on a PE router. A VPN can contain one or more VRF tables on a PE router.

A VRF contains the routing information that defines the customer VPN site that is attached to a PE router. A VRF consists of the following elements:

- An IP routing table
- A derived Cisco Express Forwarding (CEF) table
- A set of interfaces that use the forwarding table
- A set of rules and routing protocols that determine what goes into the forwarding table

An IP routing table and the CEF table store packet forwarding information for each VRF. Another routing table and CEF table for each VRF prevent information from being forwarded outside a VPN and prevent packets that are outside a VPN from being forwarded to a router within the VPN.

Components of the VPN ID

Each VPN ID defined by RFC 2685 consists of the following elements:

- An Organizational Unique Identifier (OUI), a three-octet hex number

  The IEEE Registration Authority assigns OUIs to any company that manufactures components under the ISO/IEC 8802 standard. The OUI is used to generate universal LAN MAC addresses and protocol identifiers for use in local and metropolitan area network applications. For example, an OUI for Cisco Systems is 00-03-6B (hex).
- A VPN index, a four-octet hex number, which identifies the VPN within the company.

Use the **vpn id** command and specify the VPN ID in the following format:

vpn id *oui*:*vpn-index*

A colon separates the OUI from the VPN index. See the **vpn id** command reference page for more information.

DHCP

Using DHCP network administrators can centrally manage and automate the assignment of IP addresses in an organization's network. The DHCP application uses the VPN ID as follows:

Step 1 A VPN DHCP client requests a connection to a PE router from a VRF interface.

Step 2 The PE router determines the VPN ID associated with that interface.

Step 3 The PE router sends a request with the VPN ID and other information for assigning an IP address to the DHCP server.

Step 4 The DHCP server uses the VPN ID and IP address information to process the request.

Step 5 The DHCP server sends a response back to the PE router, allowing the VPN DHCP client access to the VPN.

Remote Authentication Dial-In User Service

A Remote Authentication Dial-In User Service (RADIUS) server (or daemon) provides authentication and accounting services to one or more client network access servers (NASs). RADIUS servers authenticate users and return all configuration information necessary for the client to deliver service to the users.

Typically, a user login consists of a query (Access-Request) from the NAS to the RADIUS server and a corresponding response (Access-Accept or Access-Reject) from the server.

- The Access-Request packet contains the user name, encrypted password, NAS IP address, VPN ID, and port. The format of the request also provides information on the type of session that the user wants to initiate.
- The RADIUS server returns an Access-Accept response if it finds the user name and verifies the password. The response includes a list of attribute-value pairs that describe the parameters to be used for this session. If the user is not authenticated an Access-Reject is sent by the RADIUS server and access is denied.

Benefits

The MPLS VPN ID feature provides the following benefits:

- Remote access applications, such as the Remote Authentication Dial-In User Service (RADIUS) and Dynamic Host Configuration Protocol (DHCP), can use the MPLS VPN ID feature to identify a VPN. RADIUS can use the VPN ID to assign dial-in users to the proper VPN, based on each user's authentication information.
- A VPN is private and uses a private address space that might also be used by another VPN or by the Internet. The IP address used in a VPN is only significant to the VPN in which it exists. The VPN ID identifies the VPN to which the IP address belongs.
- The MPLS VPN ID feature standardizes the VPN identification method, as described in RFC 2685.

Restrictions

The MPLS VPN ID feature has the following restrictions:

- The VPN ID is not used to control the distribution of routing information or to associate IP addresses with VPN IDs in routing updates.
- Configure all the PE routers that belong to the same VPN with the same VPN ID. Make sure the VPN ID is unique to the Service Provider network.

Related Documents

The following documents provide more information about the MPLS VPN ID feature:

Cisco Documentation

- *Cisco IOS Security Configuration Guide,* Release 12.2
- *Cisco IOS Security Command Reference,* Release 12.2
- *Introduction to Cisco MPLS VPN Technology*
- *DHCP Relay Support for MPLS VPN Suboptions*
- *MPLS Virtual Private Networks*

Other Documentation

The list of public OUI assignments:
http://standards.ieee.org/regauth/oui/oui.txt

Supported Platforms

This feature is supported on the following platforms:

- Cisco 7200 series
- Cisco 7400 series
- Cisco 7500 series

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 quickly 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.

Supported Standards, MIBs, and RFCs

Standards

- IEEE Std 802-1990, *IEEE Local and Metropolitan Area Networks: Overview and Architecture*

MIBs

No new or modified MIBs are supported by this feature.

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

- RFC 2685—*Virtual Private Networks Identifier*

Prerequisites

Each VRF configured on a PE router can have a VPN ID configured. Configure all the PE routers that belong to the same VPN with the same VPN ID. Make sure the VPN ID is unique to the Service Provider network.

Configuration Tasks

See the following sections for configuration tasks for the MPLS VPN ID feature. Each task in the list is identified as either optional or required.

- Specifying a VPN ID (required)
- Verifying the VPN ID Configuration (optional)

Specifying a VPN ID

To specify a VPN ID on a PE router, perform the following steps beginning in global configuration mode:

	Command	Purpose
Step 1	`Router(config)# ip vrf vrf-name`	Creates a VRF routing table and a CEF forwarding table and enters VRF configuration mode. • *vrf-name*—Name assigned to a VRF.
Step 2	`Router(config-vrf)# vpn id oui:vpn-index`	Assigns the a VPN ID to the VRF. • *oui*:—An organizationally unique identifier. The IEEE organization assigns this identifier to companies. The OUI is restricted to three octets. • *vpn-index*—This value identifies the VPN within the company. This VPN index is restricted to four octets.

Verifying the VPN ID Configuration

To display information about the VRF tables on the PE router, use the **show ip vrf** command. This example displays three VRF tables called vpn1, vpn2, and vpn5.

```
Router# show ip vrf
  Name                              Default RD          Interfaces
  vpn1                              100:1               Ethernet1/1
                                                        Ethernet1/4
  vpn2                              <not set>
  vpn5                              500:1               Loopback2
```

To ensure that the PE router contains the VPN ID you specified, issue the **show ip vrf id** command. The following example shows that only VRF tables vpn1 and vpn2 have VPN IDs assigned. The VRF table called vpn5 is not displayed, because it does not have a VPN ID.

```
Router# show ip vrf id
VPN Id          Name                              RD
2:3             vpn2                              <not set>
A1:3F6C         vpn1                              100:1
```

This command displays all the VPN IDs that are configured on the router, their associated VRF names, and VRF route distinguishers (RDs). If a VRF table in the PE router has not been assigned a VPN ID, that VRF entry is not included in the output. See the **show ip vrf** command reference page for more information.

To see all the VRFs on a PE router, issue the **show ip vrf detail** command:

```
Router# show ip vrf detail
VRF vpn1; default RD 100:1; default VPNID A1:3F6C
  Interfaces:
    Ethernet1/1             Ethernet1/4
  Connected addresses are not in global routing table
  Export VPN route-target communities
    RT:100:1
  Import VPN route-target communities
```

```
    RT:100:1                RT:500:1
  No import route-map
  No export route-map
VRF vpn2; default RD <not set>; default VPNID 2:3
  No interfaces
  Connected addresses are not in global routing table
  No Export VPN route-target communities
  No Import VPN route-target communities
  No import route-map
  No export route-map
VRF vpn5; default RD 500:1; default VPNID <not set>
  Interfaces:
```

Configuration Examples

This section provides the following example of configuring a VPN ID:

- Configuring a VPN ID, page 7

Configuring a VPN ID

The following example updates the VPN ID assigned to the VRF table called vpn1:

```
Router# configuration terminal
Enter configuration commands, one per line.  End with CNTL/Z.
Router(config)# ip vrf vpn1
Router(config-vrf)# vpn id a1:3f6c
Router(config-vrf)# end
```

Command Reference

This section documents modified commands. All other commands used with this feature are documented in the Cisco IOS Release 12.2 command reference publications.

- **show ip vrf**
- **vpn id**

show ip vrf

To display the set of defined VRFs and associated interfaces, use the **show ip vrf** command in privileged EXEC mode.

show ip vrf [{**brief** | **detail** | **interfaces** | **id**}] [*vrf-name*] [*output-modifiers*]

Syntax Description

brief	(Optional) Displays concise information on the VRFs and associated interfaces.
detail	(Optional) Displays detailed information on the VRFs and associated interfaces.
interfaces	(Optional) Displays detailed information about all interfaces bound to a particular VRF, or any VRF.
id	(Optional) Displays the VPN IDs that are configured in a PE router for different VPNs.
vrf-name	(Optional) Name assigned to a VRF.
output-modifiers	(Optional) For a list of associated keywords and arguments, use context-sensitive help.

When no optional parameters are specified, the command shows concise information about all configured VRFs.

Command Modes

Privileged EXEC

Command History

Release	Modification
12.0(5)T	This command was introduced.
12.0(17)ST	This command was modified to include the **id** keyword. Plus, VPN ID information was added to the output of the **show ip vrf detail** command.
12.2(4)B	This command was integrated into Cisco IOS Release 12.2(4)B.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

Use this command to display information about VRFs. Two levels of detail are available; use the **brief** keyword or no keyword to display concise information, or use the **detail** keyword to display all information. To display information about all interfaces bound to a particular VRF, or to any VRF, use the **interfaces** keyword. To display information about VPN IDs assigned to a PE router, use the **id** keyword.

Examples

This example shows brief information for the VRFs currently configured:

```
Router# show ip vrf

  Name                Default RD          Interfaces
  vrf1                100:1               Ethernet1/3
  vrf2                100:2               Ethernet0/3
```

Table 1 describes the fields shown in this example.

Table 1 show ip vrf Field Descriptions

Field	Description
Name	Specifies the VRF name.
Default RD	Specifies the default route distinguisher.
Interfaces	Specifies the network interfaces.

This example shows detailed information for the VRF called vrf1:

```
Router# show ip vrf detail vrf1

VRF vrf1; default RD 100:1 default VPNID A1:3F6C
 Interfaces:
  Ethernet1/3
 Connected addresses are in global routing table
 Export VPN route-target communities
  RT:100:1
 Import VPN route-target communities
  RT:100:1
 No import route-map
```

Table 2 describes the significant fields shown in the output.

Table 2 show ip vrf detail Field Descriptions

Field	Description
VPNID	Specifies the VPN ID assigned to the VRF.
Interfaces	Specifies the network interfaces.
Export	Specifies VPN route-target export communities.
Import	Specifies VPN route-target import communities.

This example shows the interfaces bound to a particular VRF:

```
Router# show ip vrf interfaces

Interface       IP-Address      VRF                     Protocol
Ethernet2       130.22.0.33     blue_vrf                up
Ethernet4       130.77.0.33     hub                     up
router#
```

Table 3 describes the significant fields shown in the output.

Table 3 show ip vrf interfaces Field Descriptions

Field	Description
Interface	Specifies the network interfaces for a VRF.
IP-Address	Specifies the IP address of a VRF interface.
VRF	Specifies the VRF name.
Protocol	Displays the state of the protocol (up or down) for each VRF interface.

This example displays all the VPN IDs that are configured in the router and their associated VRF names and VRF route distinguishers (RDs).

```
Router# show ip vrf id
VPN Id          Name                            RD
2:3             vpn2                            <not set>
A1:3F6C         vpn1                            100:1
```

Table 4 describes the significant fields shown in the output.

Table 4 show ip vrf id Field Descriptions

Field	Description
VPN ID	Specifies the VPN ID assigned to the VRF.
Name	Specifies the VRF name.
RD	Specifies the route distinguisher.

Related Commands

Command	Description
import map	Configures an import route map for a VRF.
ip vrf	Configures a VRF routing table.
ip vrf forwarding	Associates a VRF with an interface or subinterface.
rd	Creates routing and forwarding tables for a VRF.
route-target	Creates a route-target extended community for a VRF.
vpn id	Assigns a VPN ID to a VRF.

vpn id

To set or update a VPN ID on a VRF, use the **vpn id** command in VRF configuration mode. To remove the VPN ID from the VRF, use the **no** form of this command. To change the VPN ID, issue the command again. The new ID overwrites the old one.

vpn id *oui:vpn-index*

no vpn id [*oui:vpn-index*]

Syntax Description

oui	An organizationally unique identifier. The IEEE organization assigns this identifier to companies. The OUI is restricted to three octets.
vpn-index	This value identifies the VPN within the company. This VPN index is restricted to four octets.

Defaults

By default, the VPN ID is not set.

Command Modes

VRF configuration

Command History

Release	Modification
12.0(17)ST	This command was introduced.
12.2(4)B	This command was integrated into Cisco IOS Release 12.2(4)B.
12.2(8)T	This command was integrated into Cisco IOS Release 12.2(8)T.
12.2(14)S	This command was integrated into Cisco IOS Release 12.2(14)S.

Usage Guidelines

Each VRF configured in a PE router can have a VPN ID. Use the same VPN ID for the PE routers that belong to the same VPN. Make sure the VPN ID is unique for each VPN in the Service Provider network.

Examples

In the following example, the VPN ID of 0000a100003f6c is assigned to a VRF called “vpn1”:

```
Router(config)# ip vrf vpn1
Router(config-vrf)# vpn id a1:3f6c
```

Related Commands

Command	Description
show ip vrf id	Displays all the VPN IDs that are configured in the router and their associated VRF names and VRF route distinguishers (RDs).
show ip vrf detail	Displays all the VRFs on a router.