NetFlow MPLS Label Export

The NetFlow MPLS Label Export feature allows a label switch router (LSR) to collect and export Multiprotocol Label Switching (MPLS) labels allocated by the LSR when an adjacent router pushes that label on the top of the label stack of a transit packet. At the same time, the LSR collects the prefix associated with the MPLS label and the application that allocated the label. The router collects the information in a table called the MPLS Prefix/Application/Label (PAL) table and exports this data to a NetFlow collector as the label is allocated or, if so configured, periodically exports the full MPLS PAL table.

You can use this information to create a provider edge (PE)-to-PE matrix, which is useful for network traffic planning and billing. To realize this benefit, you must export the MPLS label information to a NetFlow collector for analysis. This feature also provides information that a NetFlow collector can use to create a Virtual Private Network (VPN) routing and forwarding instance (VRF)-to-PE and PE-to-VRF matrix.

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 at the end of this module.

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.

Prerequisites for NetFlow MPLS Label Export

The NetFlow MPLS Label Export feature requires the following:

- NetFlow configured on the LSR
- MPLS enabled on the LSR

If you are exporting data to a Cisco NetFlow collector, the following requirements apply:

- NetFlow Version 9 export format configured on the LSR
- NetFlow collector and analyzer that can use MPLS PAL records exported in NetFlow Version 9 format

Restrictions for NetFlow MPLS Label Export

The following restrictions apply to the NetFlow MPLS Label Export feature for Cisco IOS 12.2S releases and Cisco IOS Release 12.5(1):

- The MPLS PAL table does not support the export of information for the following:
  - IP Version 6 (IPv6) labels
  - IP Multicast labels
  - Quality of service (QoS) labels
  - Traffic engineering (TE) tunnel headend labels

- The ability to create a VRF-to-VRF traffic matrix is not supported.

- If one application deallocates a label and a second application soon reallocates the same label, the NetFlow collector might not be able to determine how many packets flowed while the label was owned by each application.

- In MPLS PAL table records, for labels allocated by VPNs, Border Gateway Protocol (BGP) IPv4, or BGP VPN Version 4 (VPNv4), the stored prefix can be either 0.0.0.0 or a route distinguisher (RD)-specific address:
  - If you do not configure the **mplsexportvpnv4prefixes** command, VPN prefixes are not tracked in the MPLS PAL table. These prefixes are displayed by the **showmplsflowmappings** command as 0.0.0.0.
  - If you configure the **mplsexportvpnv4prefixes** command, VPN prefixes are tracked and RD-specific addresses are displayed by the **showmplsflowmappings** command.

Information About NetFlow MPLS Label Export

The following sections contain useful information for understanding how to configure and use the NetFlow MPLS Label Export feature:

MPLS Label Information Gathering and Exporting

In a Cisco IOS 12.0S, 12.3T, or 12.4T release that supports the MPLS-Aware NetFlow feature, the mapping of the MPLS label to a prefix and an MPLS application is achieved through the use of the Label Forwarding Information Base (LFIB). You can display this information with the **showipcacheverboseflow** command. These releases do not support the NetFlow MPLS Label Export feature.

In a Cisco IOS 12.2(28)SB release or later release that supports the NetFlow MPLS Label Export feature, the mapping of the MPLS label to a destination prefix or Forwarding Equivalence Class (FEC) and to the MPLS application currently using the label is achieved through the use of an MPLS PAL table. Each supported MPLS application on the router where the NetFlow MPLS Label Export feature is configured registers its label values, prefixes, and owning applications as the labels are allocated. This label-tracking functionality operates on the Route Processor (RP) software.

The MPLS label information (label to prefix and application) mapping is exported to a NetFlow collector at the time when the label is allocated. You can configure periodic export of the full MPLS PAL table to a collector for further processing and analysis through the use of the **mplsexportinterval** command.

An *interval* argument to the **mplsexportinterval** command controls the time in minutes between full MPLS PAL table exports to the NetFlow collector. You can configure an interval in the range of 0 to 10080 (1 week) minutes:

- If you want to export MPLS PAL table information only when the label is allocated, then configure this command with a 0 time interval with the **mplsexportinterval0** command.

- If you want to trigger an immediate export of the full MPLS PAL table, reconfigure the command with an *interval* argument that is different from the interval that is configured. For example, if you have configured the **mplsexportinterval1440** command, reconfigure the command with any nonzero number except 1440.

- If you have a complex network that generates a large amount of traffic, configure a large interval between MPLS PAL table exports. You might want to configure an interval from 6 to 12 hours (360 and 720 minutes).

The *interval* argument that you specify is the least amount of time that passes before another export of the MPLS PAL table occurs. The system could delay the MPLS PAL table export for 10 minutes if the PAL export queue already contains a large number of entries. This could happen if the export occurred at a time when thousands of routes just came up, or if NetFlow did not have the time to clear the export queue from either a previous export of the full table or a previous time when thousands of routes came up in a brief period of time.

After you have entered the **mplsexportinterval** command, you can use the **showmplsflowmappings** command to display MPLS PAL table entries. To display information about the number of MPLS PAL records exported to the collector, use the **showipflowexportverbose** command.

Labels Allocated by VPNs BGP IPv4 or BGP VPNv4 in the MPLS PAL Table

If you want to see VPN prefix information, that is, labels allocated by VPN, BGP IPv4, or BGP VPNv4, you need to configure the **mplsexportvpnv4prefixes** command. If you do not configure the **mplsexportvpnv4prefixes** command, MPLS PAL stores labels allocated by these application as prefix 0.0.0.0.

After you configure the **mplsexportvpnv4prefixes** command, the VPN prefix and the associated RD are stored in the MPLS PAL table. VPN addresses are made unique by adding an RD to the front of the address. The RD removes any ambiguity when the same VPN prefix is used for more than one VRF.

Note   To export VPN prefixes and associated RDs from the MPLS PAL table, the first time you configure the **mplsexportvpnv4prefixes** command you need to save the configuration and reboot the router or clear all routes from the table.

To display the VPN prefix entries in the MPLS PAL table, use the **showmplsflowmappings** command.

With the **mplsexportvpnv4prefixes** command configured, a line of the output might look like this:

```
Router# show mpls flow mappings
Label    Owner    Route-Distinguisher Prefix         Allocated
.
.
.
27       BGP      100:1               10.34.0.0       00:57:48
```
The format of the Route-Distinguisher field in the output depends on how the RD was configured. The RD can be configured in the as-number:network number (ASN:nn) format, as shown in the example, or it can be configured in the IP address:network number format (IP-address:nn).

If you did not configure the **mplsexportvpnv4prefixes** command, a line of the output looks like this:

```
Router# show mpls flow mappings
.
.
.
Label    Owner    Route-Distinguisher Prefix         Allocated
21       BGP                          0.0.0.0         00:52:18
```
The Route-Distinguisher field is not populated and the Prefix is displayed as 0.0.0.0.

If the MPLS PAL table tracks a per-VRF aggregate label and you configured the **mplsexportvpnv4prefixes** command, the **showmplsflowmappings** command displays the RD associated with the per-VRF aggregate label, but the prefix for the per-VRF aggregate label is reported as 0.0.0.0. If the **mplsexportvpnv4prefixes** command is not configured, the per-VRF aggregate label is reported with no RD and prefix 0.0.0.0, and you cannot distinguish the per-VRF aggregate label from a normal BGP label.

MPLS PAL Table Record Export

In Cisco IOS Release 12.0S and later releases, the export of MPLS-Aware NetFlow cache records makes use of the NetFlow Version 9 export format data and template. The export of MPLS PAL table entries also uses the NetFlow Version 9 export format. MPLS PAL packets are exported as NetFlow options packets rather than NetFlow data packets. NetFlow options packets are defined in *Cisco Systems NetFlow Services Export Version 9,* Request for Comments (RFC) 3954.

The RP on the PE router learns and queues the MPLS PAL table records for export. The RP can combine large numbers of PAL table entries in a single Version 9 record and send the record to the NetFlow collector. The information exported by the RP contains instances of the following for each tracked label:

Label, allocating-application (Owner), Route-Distinguisher, Prefix, time stamp (Allocated)

Because the mapping may change as labels expire and are reused, each PAL record contains a time stamp indicating the system uptime at which the label was allocated.

NetFlow Export Template Format Used for MPLS PAL Entries

This is the NetFlow Version 9 export template format used for MPLS PAL entries:

MPLS label: 3 bytes

MPLS label application type: 1 byte

MPLS label IP prefix: 4 bytes

MPLS VPN prefix RD: 8 bytes

MPLS label allocation time: 4 bytes

MPLS Application Types Exported

The following MPLS application types are exported in the MPLS label application type field:

TE = 1

ATOM = 2

VPN = 3

BGP = 4

LDP = 5

Options Template and Options Data Record for MPLS PAL Record Export

The figure below shows an example of the options template and options data record for MPLS PAL record export. This example shows that MPLS label 44 was allocated by a VPN 0x03 at 08:50:20 and is associated with the IP address 10.20.0.20 and with RD 100:1.

Figure 1: MPLS PAL Export Format Record
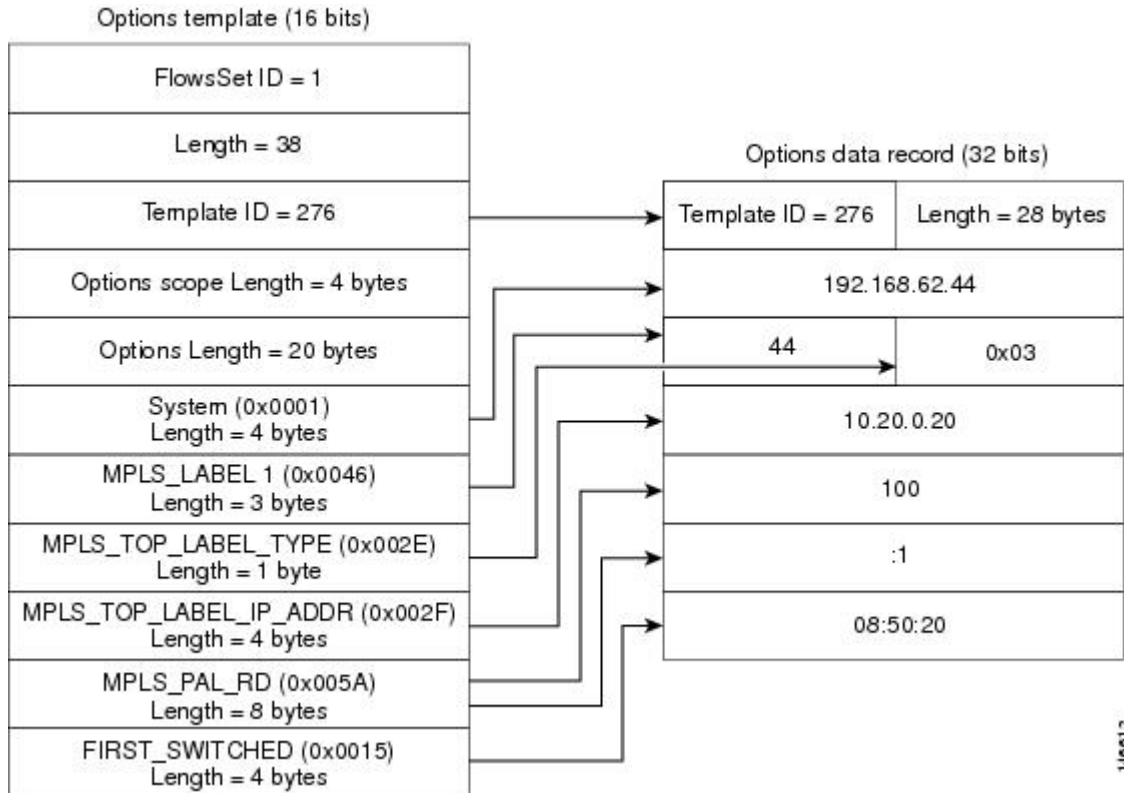
MPLS PAL and NetFlow Statistics Correlation on a NetFlow Collector

A NetFlow collector can gather the PAL NetFlow packets from a PE router and correlate the label mappings with the recent NetFlow records from adjacent provider core (P) routers.

For example, the MPLS PAL export packet contains MPLS label mappings over a period of time, as each label is allocated and reallocated on the PE router. The packet might contain the following information:

```
label 5, prefix 10.0.0.0,  type LDP, 12:00:00
label 4, prefix 10.10.0.0, type LDP, 13:00:00
label 5, prefix 10.9.0.0,  type VPN, 14:00:00
```
The NetFlow collector then receives a NetFlow packet from the adjacent P router indicating the following:

```
label 5, 123 packets, 9876 bytes, time 12:22:15.
```
The collector would match the time range known from the PAL packets with the line card (LC) packet time stamp. This would result in the correct mapping for label 5 at time 12:22:15, as follows:

```
label 5, application LDP, prefix 10.0.0.0.
```

The NetFlow collector needs to be able to handle relative differences in the time stamps caused by different reboot times of the P and PE routers.

To implement the offline label mapping checks in the NetFlow collector, the collector needs to maintain a history of label mappings obtained from the MPLS PAL NetFlow packets sent by the RP. If a label is deallocated and reallocated, the collector should track both the old and the new MPLS PAL information for the label.

Note   On a rare occasion, the collector might not be able to accurately track how many packets flowed for a label that has been deallocated by one application and soon reallocated by another application.

MPLS Label Mapping on a Line Card

Label to prefix and application mapping is registered and exported from the router RP. This functionality does not occur on the line card. If you want to see the mapping for a particular label on a line card and the label of interest is tracked by the MPLS PAL table, then you can do the following:

- Enter the **showmplsforwarding** command on the line card.

- Enter the **showmplsflowmappings** on the RP.

- Compare the output of the two commands.

You might find the|**include**keyword to the commands useful in this case. For example, You could enter the**showmplsflowmappings**|**include777** command to see the information for any label with substring 777.

How to Configure NetFlow MPLS Label Export

Perform the following tasks to configure the NetFlow MPLS Label Export feature on an LSR. This feature provides the label, prefix, and application mapping through the MPLS PAL table that collects and exports the data to a NetFlow collector.

Configuring NetFlow MPLS Label Export and MPLS PAL Table Export

Perform this task to configure the NetFlow MPLS Label Export feature and MPLS PAL table export to a NetFlow collector. You can use the information generated for network traffic planning and billing.

The following task must be completed before MPLS labels are allocated by the router for the MPLS PAL table to be exported to a NetFlow collector.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls export interval** *interval*
4. **end**
5. **copy running-config startup-config**
6. **exit**
7. Reboot the router.

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** Router# configure terminal	Enters global configuration mode.
Step 3	**mpls export interval** *interval* **Example:** Router(config)# mpls export interval 360 **Example:**	Configures a periodic time interval for the export of the entire MPLS PAL table to a NetFlow collector. • The *interval* argument specifies the time in minutes between full PAL table exports. The range of valid time intervals is 0 to 10,080 minutes. • We recommend that you select a time interval from 360 minutes (6 hours) to 1440 minutes (24 hours) depending on the size of your network and how often the NetFlow collector might be restarted. • If you enter an interval of 0, full PAL table exports are disabled. PAL information is exported only as labels are allocated. • If you need to restart your NetFlow collector and want to learn PAL information immediately, you can change the *interval* argument. When you change the time interval, the application exports the full PAL table. **Note** Allocated labels are tracked only after you enter the **mplsexportinterval** command. Any labels allocated before you enter this command are not tracked.
Step 4	**end** **Example:** Router(config)# **end**	Exits to privileged EXEC mode.

	Command or Action	Purpose

Step 5	**copy running-config startup-config**
	
	Example:
	
	`Router# copy running-config`
	`startup-config`
		Copies the modified configuration into router NVRAM, permanently saving the settings.
		
		The next time the router is reloaded or rebooted the NetFlow MPLS Label Export feature is already part of the configuration.

Step 6	**exit** **Example:** `Router# exit`	Exits to user EXEC mode.
Step 7	Reboot the router.	(Optional) Saves the configuration and reboots the router to ensure that the information collected by this feature is complete.

Displaying Information About the MPLS PAL Table

Perform this task to display information about the MPLS PAL table. The information displayed includes the label, the application that allocated the label, an RD and destination prefix associated with the label, and the time the label was allocated by the application.

SUMMARY STEPS

1. **enable**
2. **show mpls flow mappings**
3. **show ip flow export verbose | include PAL**
4. **exit**

DETAILED STEPS

Step 1   **enable**
Use this command to enable privileged EXEC mode. Enter your password if prompted. For example:

Example:

```
Router> enable
Router#
```

Step 2   **show mpls flow mappings**
Use this command to display entries in the MPLS PAL table. For example:

Example:

```
Router# show mpls flow mappings
Label     Owner    Route-Distinguisher Prefix          Allocated
18        LDP                          10.0.0.5         00:52:10
21        BGP                          0.0.0.0          00:52:18
22        BGP                          0.0.0.0          00:52:18
25        BGP                          0.0.0.0          00:51:44
26        LDP                          10.32.0.0        00:52:10
27        TE-MIDPT                     10.30.0.2        00:52:06
28        LDP                          10.33.0.0        00:52:10
29        LDP                          10.0.0.1         00:52:10
30        LDP                          10.0.0.3         00:52:10
```

In this example, the **mplsexportvpnv4prefixes** command was not configured. Therefore, the MPLS PAL functionality did not export an RD for the BGP application, and the associated prefix is exported as 0.0.0.0.

The following shows sample output from the **showmplsflowmappings**command if you previously entered the **mplsexportvpnv4prefixes** command:

Example:

```
Router# show mpls flow mappings
Label     Owner    Route-Distinguisher Prefix          Allocated
16        LDP                          10.0.0.3         00:58:03
17        LDP                          10.33.0.0        00:58:03
19        TE-MIDPT                     10.30.0.2        00:58:06
20        LDP                          10.0.0.5         00:58:03
23        LDP                          10.0.0.1         00:58:03
24        LDP                          10.32.0.0        00:58:03
27        BGP      100:1               10.34.0.0        00:57:48
31        BGP      100:1               10.0.0.9         00:58:21
32        BGP      100:1               10.3.3.0         00:58:21
```

Step 3 **show ip flow export verbose | include PAL**

Use this command to display the number of MPLS PAL records that were exported to the NetFlow collector. For example:

Example:

```
Router# show ip flow verbose | include PAL
6 MPLS PAL records exported
```

When you specify the **verbose** keyword and MPLS PAL records have been exported using NetFlow Version 9 data format, the command output contains an additional line that precedes the "*x* records exported in *y* UDP datagrams" line.

Step 4 **exit**

Use this command to exit to user EXEC mode. For example:

Example:

```
Router# exit
Router>
```

Configuring the Export of MPLS VPN Version 4 Label Information from the MPLS PAL Table to a NetFlow Collector

Perform the following task to configure the export of VPNv4 label information from the MPLS PAL table to a NetFlow collector.

This allows you to track VPN prefix information for MPLS labels allocated by VPNs, BGP IPv4, and BGP VPNv4. You can use the data analyzed by the collector to assist in network traffic planning and billing.

Before You Begin

A VRF must be configured on the router.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **mpls export interval** *interval*
4. **mpls export vpnv4 prefixes**
5. **end**
6. **copy running-config startup-config**
7. **exit**
8. Reboot the router.
9. **enable**
10. **show mpls flow mappings**

DETAILED STEPS

	Command or Action	Purpose
Step 1	**enable** **Example:** `Router> enable`	Enables privileged EXEC mode. • Enter your password if prompted.
Step 2	**configure terminal** **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**mpls export interval** *interval* **Example:** `Router(config)# mpls export interval 1440`	Configures the collection and export of MPLS PAL information to a NetFlow collector. • The *interval* argument specifies the time in minutes between full PAL table exports. The range of valid time intervals is 0 to 10,080 minutes.

	Command or Action	Purpose
		• We recommend that you select a time interval of 6 hours (360 minutes) to 24 hours (1440 minutes) depending on the size of your network.
		• If you enter an interval of 0, full PAL table exports are disabled. PAL information is exported only as labels are allocated.
		• If you need to restart your NetFlow collector and want to learn PAL information immediately, you can change the *interval* argument. When you change the time interval, the application exports the full PAL table.
Step 4	**mpls export vpnv4 prefixes** **Example:** Router(config)# mpls export vpnv4 prefixes	Configures the tracking and export of VPNv4 label information from the MPLS PAL table to a NetFlow collector.
Step 5	**end** **Example:** Router(config)# **end**	Exits to privileged EXEC mode.
Step 6	**copy running-config startup-config** **Example:** Router# copy running-config startup-config	Copies the modified configuration into router NVRAM, permanently saving the settings. The next time the router is rebooted the tracking and export of VPNv4 label information from the MPLS PAL table to a NetFlow collector is already part of the configuration.
Step 7	**exit** **Example:** Router# exit	Exits to user EXEC mode.
Step 8	Reboot the router.	(Optional) Saves the configuration and reboots the router to ensure that the information collected by this feature is complete.
Step 9	**enable** **Example:** Router> enable	Enables privileged EXEC mode. • Enter your password if prompted.
Step 10	**show mpls flow mappings** **Example:** Router# show mpls flow mappings	Displays MPLS PAL table entries that include VPNv4 prefixes and VPN RDs.

Configuration Examples for NetFlow MPLS Label Export

Configuring NetFlow MPLS Prefix Application Label Table Export Examples

The following examples show how to configure NetFlow MPLS PAL table export on a PE router.

This example shows how to configure the export of the full MPLS PAL table every 480 minutes (8 hours):

```
configure terminal
!
mpls export interval 480
end
copy running-config startup-config
exit
```

This example shows how to configure MPLS PAL information export only as the labels are allocated:

```
configure terminal
!
mpls export interval 0
end
copy running-config startup-config
exit
```

In this example, the full MPLS PAL table is not exported repeatedly.

Configuring the Export of MPLS VPNv4 Label Information from the MPLS PAL Table Example

The following example shows how to configure the export of MPLS VPNv4 label information from the MPLS PAL table:

```
configure terminal
!
mpls export interval 720
mpls export vpnv4 prefixes
end
copy running-config startup-config
exit
```

The full MPLS PAL table with MPLS VPNv4 label information is configured to export to the NetFlow collector every 720 minutes (12 hours).

Additional References

The following sections provide references related to the NetFlow MPLS Label Export feature.

Related Documents

Related Topic	Document Title
Tasks for configuring MPLS-aware NetFlow	Configuring MPLS-aware NetFlow
Overview of the NetFlow application and advanced NetFlow features and services	Cisco IOS NetFlow Overview
Tasks for configuring NetFlow to capture and export network traffic data	Configuring NetFlow and NetFlow Data Export
Tasks for configuring MPLS egress NetFlow accounting	Configuring MPLS Egress NetFlow Accounting
Detailed information about the fields available in Version 9 export format and about export format architecture	Cisco IOS NetFlow Version 9 Flow-Record Format

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

RFCs

RFC	Title
RFC 3954	Cisco Systems NetFlow Services Export Version 9
RFC 2547	BGP/MPLS VPNs

Technical Assistance

Description	Link
The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies. To receive security and technical information about your products, you can subscribe to various services, such as the Product Alert Tool (accessed from Field Notices), the Cisco Technical Services Newsletter, and Really Simple Syndication (RSS) Feeds. Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.	http://www.cisco.com/techsupport

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 Multiprotocol Label Switching Command Reference* at http://www.cisco.com/en/US/docs/ios/mpls/command/reference/mp_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* .

- **mpls export interval**
- **mpls export vpnv4 prefixes**
- **show ip flow export**
- **show mpls flow mappings**

Feature Information for NetFlow MPLS Label Export

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 NetFlow MPLS Label Export

Feature Name	Releases	Feature Information
NetFlow MPLS Label Export	12.2(28)SB 12.2(33)SRA	The NetFlow MPLS Label Export feature provides the label switch router (LSR) with the capability of collecting and exporting the top label in the MPLS label stack along with its prefix or Forwarding Equivalence Class (FEC) and the application allocating the label to a NetFlow collector for supported MPLS applications. In 12.2(28)SB, this feature was introduced. In 12.2(33)SRA, this feature was integrated into a 12.2SRA release.

Glossary

BGP --Border Gateway Protocol. An interdomain routing protocol that replaces Exterior Gateway Protocol (EGP). A BGP system exchanges reachability information with other BGP systems. It is defined by RFC 1163.

export packet --A type of packet built by a device (for example, a router) with NetFlow services enabled. The packet is addressed to another device (for example, the NetFlow Collection Engine). The packet contains NetFlow statistics. The other device processes the packet (parses, aggregates, and stores information on IP flows).

FEC --Forward Equivalency Class. A set of packets that can be handled equivalently for the purpose of forwarding and thus is suitable for binding to a single label. The set of packets destined for an address prefix is one example of an FEC. A flow is another example

flow --A unidirectional stream of packets between a given source and destination--each of which is defined by a network-layer IP address and transport-layer source and destination port numbers. A unique flow is defined as the combination of the following key fields: source IP address, destination IP address, source port number, destination port number, Layer 3 protocol type, type of service (ToS), and input logical interface.

flowset --A collection of flow records that follow the packet header in an export packet. A flowset contains information that must be parsed and interpreted by the NetFlow Collection Engine. There are two different types of flowsets: template flowsets and data flowsets. An export packet contains one or more flowsets, and both template and data flowsets can be mixed in the same export packet.

IPv6 --IP Version 6. Replacement for IP Version 4 (IPv4). IPv6 includes support for flow ID in the packet header, which can be used to identify flows. Formerly called IPng (next generation).

label --A short, fixed-length identifier that tells switching nodes how the data (packets or cells) should be forwarded.

LDP --Label Distribution Protocol. A standard protocol that operates between Multiprotocol Label Switching (MPLS)-enabled routers to negotiate the labels (addresses) used to forward packets. The Cisco proprietary version of this protocol is the Tag Distribution Protocol (TDP).

LFIB --Label Forwarding Information Base. A data structure and way of managing forwarding in which destinations and incoming labels are associated with outgoing interfaces and labels.

LSR --label switch router. A router that forwards packets in a Multiprotocol Label Switching (MPLS) network by looking only at the fixed-length label.

MPLS --Multiprotocol Label Switching. A switching method in which IP traffic is forwarded through use of a label. This label instructs the routers and the switches in the network where to forward the packets. The forwarding of MPLS packets is based on preestablished IP routing information.

NetFlow --A Cisco IOS application that provides statistics on packets flowing through the router. It is emerging as a primary network accounting and security technology.

NetFlow Collection Engine (formerly NetFlow FlowCollector)--A Cisco application that is used with NetFlow on Cisco routers and Catalyst series switches. The NetFlow Collection Engine collects packets from the router that is running NetFlow and decodes, aggregates, and stores them. You can generate reports on various aggregations that can be set up on the NetFlow Collection Engine.

NetFlow v9 --NetFlow export format Version 9. A flexible and extensible means of carrying NetFlow records from a network node to a collector. NetFlow Version 9 has definable record types and is self-describing for easier NetFlow Collection Engine configuration.

network byte order --Internet-standard ordering of the bytes corresponding to numeric values.

options data record --Special type of data record that is used in the NetFlow process. It is based on an options template and has a reserved template ID that provides information about the NetFlow process itself.

options template --A type of template record that the router uses to communicate the format of NetFlow-related data to the NetFlow collector.

P router --provider core or backbone router. A router that is part of a service provider's core or backbone network and is connected to the provider edge (PE) routers.

packet header --First part of an export packet. It provides basic information about the packet (such as the NetFlow version, number of records contained in the packet, and sequence numbering) so that lost packets can be detected.

PAL table --Prefix/Application/Label table. A data structure that collects and exports the prefix, application, and time stamp for a specific label.

PE router --provider edge router. A router that is part of a service provider's network connected to a customer edge (CE) router. All Virtual Private Network (VPN) processing occurs in the PE router.

RD --route distinguisher. An 8-byte value that is concatenated with an IPv4 prefix to create a unique VPN IPv4 prefix.

There are two formats for configuring the route distinguisher argument. It can be configured in the as-number:network number (ASN:nn) format or it can be configured in the IP address:network number format (IP-address:nn).

RP --Route Processor. A processor module in the Cisco 7000 series routers that contains the CPU, system software, and most of the memory components that are used in the router. Sometimes called a Supervisory Processor.

TE --traffic engineering. Techniques and processes that cause routed traffic to travel through the network on a path other than the one that would have been chosen if standard routing methods were used.

NetFlow MPLS Label Export

TE tunnel --traffic engineering tunnel. A label-switched tunnel that is used for traffic engineering. Such a tunnel is set up through means other than normal Layer 3 routing; it is used to direct traffic over a path.

template flowset --A collection of template records that are grouped in an export packet.

template ID --A unique number that distinguishes a template record produced by an export device from other template records produced by the same export device. A NetFlow Collection Engine application can receive export packets from several devices. You should be aware that uniqueness is not guaranteed across export devices. Thus, you should configure the NetFlow Collection Engine to cache the address of the export device that produced the template ID in order to enforce uniqueness.

VPN --Virtual Private Network. A secure IP-based network that shares resources on one or more physical networks. A VPN contains geographically dispersed sites that can communicate securely over a shared backbone.

VPNv4 prefix --IPv4 prefix preceded by an 8-byte route distinguisher. The VPN addresses are made unique by adding a route distinguisher to the front of the address.