MPLS-aware NetFlow

Multiprotocol Label Switching (MPLS)-aware NetFlow is an extension of the NetFlow accounting feature that provides highly granular traffic statistics for Cisco routers. It collects statistics on a per-flow basis just as NetFlow does. A flow is a unidirectional set of packets (IP or MPLS) that arrives at the router on the same subinterface, has the same source and destination IP addresses, has the same Layer 4 protocol, the same TCP/UDP source and destination ports, and the same type of service (TOS) byte in the IP header. In addition, an MPLS flow contains up to three of the same incoming MPLS labels of interest with experimental bits and end-of-stack bits in the same positions in the packet label stack. MPLS-aware NetFlow captures MPLS traffic that contains both IP and non-IP packets. It reports non-IP packets, but sets the IP NetFlow fields to 0. MPLS-aware NetFlow uses the NetFlow Version 9 export format. MPLS-aware NetFlow exports up to three labels of interest from the incoming label stack, the IP address associated with the top label, as well as traditional NetFlow data.

A network administrator can turn on MPLS-aware NetFlow inside an MPLS cloud on a subset of provider backbone (P) routers. These routers can export MPLS-aware NetFlow data to an external NetFlow collector device for further processing and analysis or show NetFlow cache data on a router terminal. MPLS-aware NetFlow statistics can be used for detailed MPLS traffic studies and analysis.

Feature Specifications for MPLS-aware NetFlow

Feature History	
Release	**Modification**
12.0(24)S	This feature was introduced.
Supported Platforms	
Cisco 12000 series (For specific line cards that support this feature, see Table 1.)	

Determining Platform Support Through Cisco Feature Navigator

Cisco IOS software is packaged in feature sets that are supported on specific platforms. To obtain updated information about 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. In the release section, you can compare releases side by side to display both the features unique to each software release and the features that releases have 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.

Contents

Prerequisites for MPLS-aware NetFlow

The MPLS-aware NetFlow feature requires the following:

- NetFlow configured on the label switch router (LSR)
- MPLS enabled on the LSR
- Cisco Express Forwarding (CEF) or Distributed CEF (dCEF) enabled on the LSR

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

- NetFlow Version 9 export format configured on the LSR
- NetFlow collector and analyzer capable of using MPLS-aware NetFlow export packets in Version 9 format

Table 1 lists the Cisco 12000 series line cards support for this release of MPLS-aware NetFlow.

Table 1 Cisco 12000 Series Line Cards Support for MPLS-aware NetFlow

Type	Line Card
Ethernet	1-Port GbE[1] 8-Port FE[1] 3-Port GbE 1-Port 10-GbE Modular GbE
Packet Over Sonet (POS)	4-Port OC-3 POS[1] 1-Port OC-12 POS[1] 1-Port OC-48 POS 4-Port OC-12 POS 4-Port OC-12 POS ISE 1-Port OC-48 POS ISE 4-Port OC-3 POS ISE 8-Port OC-3 POS ISE 16-Port OC-3 POS ISE 1-Port OC-192 POS ES (Edge Release) 4-Port OC-48 POS ES (Edge Release)
Channelized Interfaces	1-Port CHOC-12 (DS3)[1] 1-Port CHOC-12 (OC-3)[1] 6-Port Ch T3 (DS1)[1] 2-Port CHOC-3[1] 1-Port CHOC-48 ISE 4-Port CHOC-12 ISE
Electrical Interface	6-Port DS3[1] 12-Port DS3 [1] 6-Port E3[1] 12-Port E3[1]
Dynamic Packet Transport	1-Port OC-12 DPT[1] 1-Port OC-48 DPT 4-Port OC-48 DPT 1-Port OC-192 DPT
Asynchronous Transfer Mode (ATM)	4-Port OC-3 ATM[1] 1-Port OC-12 ATM[1]

1. This Cisco 12000 line card supports MPLS-aware NetFlow enabled in either full or sampled mode. Line cards not marked with a footnote character support MPLS-aware NetFlow in sampled mode only. In general, Cisco 12000 line cards support MPLS-aware NetFlow in the same mode as they support NetFlow.

Restrictions for MPLS-aware NetFlow

The following restrictions apply to the MPLS-aware NetFlow feature for this release:

- The maximum number of MPLS labels allowed to be captured and exported for this implementation is three.
- MPLS-aware NetFlow reports the following fields in MPLS flows as 0: IP next-hop, source and destination Border Gateway Protocol (BGP) autonomous system (AS) numbers, source and destination prefix masks.

- For MPLS packets that contain non-IP packets under the MPLS label stack, MPLS-aware NetFlow reports the following flow fields as 0: source and destination IP addresses, protocol, TOS, ports, and TCP flags.
- The IP addresses associated with the top label for traffic engineering (TE) tunnel midpoints and Any Transport over MPLS (AToM) are reported as 0.0.0.0.
- The top label type and IP address are obtained at the moment of flow export. Either can be incorrect if the top label was deleted or reassigned since the creation of the flow in the NetFlow cache.
- On the Cisco 12000 1-Port 10-GbE, Modular GbE, 1-Port OC-192 POS ES (Edge Release), and 4-Port OC-48 POS ES (Edge Release) line cards:
  - MPLS-aware NetFlow samples both IP and MPLS packets, but reports only MPLS packets with one label, ignoring all other packets (that is, IP packets and MPLS packets with more than one label).
  - MPLS-aware NetFlow does not report application (TCP/UDP) port numbers.
  - MPLS-aware NetFlow reports experimental bits in MPLS labels as 0.
- The Cisco 12000 1-Port OC-48 POS, 4-Port OC-12 POS, 16-Port OC-3 POS, 3-Port GbE, and the 1-Port OC-48 DPT line cards support MPLS-aware NetFlow in sampled mode in all microcode bundles that include IP-sampled NetFlow.

Information About MPLS-aware NetFlow

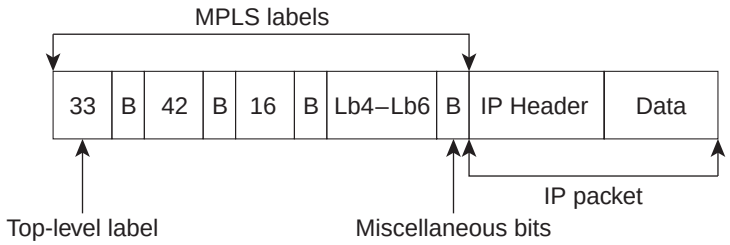
The following sections contain useful information for understanding how to configure and use the MPLS-aware NetFlow feature:

- MPLS Label Stack, page 4
- MPLS-aware NetFlow Capture and Display of MPLS Labels, page 6
- Information Captured and Exported by MPLS-aware NetFlow, page 7

MPLS Label Stack

As packets move through an MPLS network, label switch routers (LSRs) can add labels to the MPLS label stack. LSRs in an MPLS cloud can add up to six labels to the MPLS label stack. An LSR adds the MPLS labels to the top of the IP packet. Figure 1 shows an example of an incoming MPLS label stack that LSRs might have added to an IP packet as it traversed an MPLS cloud.

Figure 1 Example of an MPLS Label Stack Added to an IP Packet in an MPLS Cloud



In the example of an MPLS label stack in Figure 1:

- The 33 represents the top label of this packet.

This label was the last label added to the MPLS label stack and the label that MPLS-aware NetFlow captures if you indicate the label of interest as 1.

- The 42 represents the second MPLS label in the stack.

  MPLS-aware NetFlow captures this label if you indicate 2 (second from the top) as a label of interest.

- The 16 represents the third label in the MPLS label stack.

  MPLS-aware NetFlow captures this label if you indicate 3 (third from the top) as a label of interest.

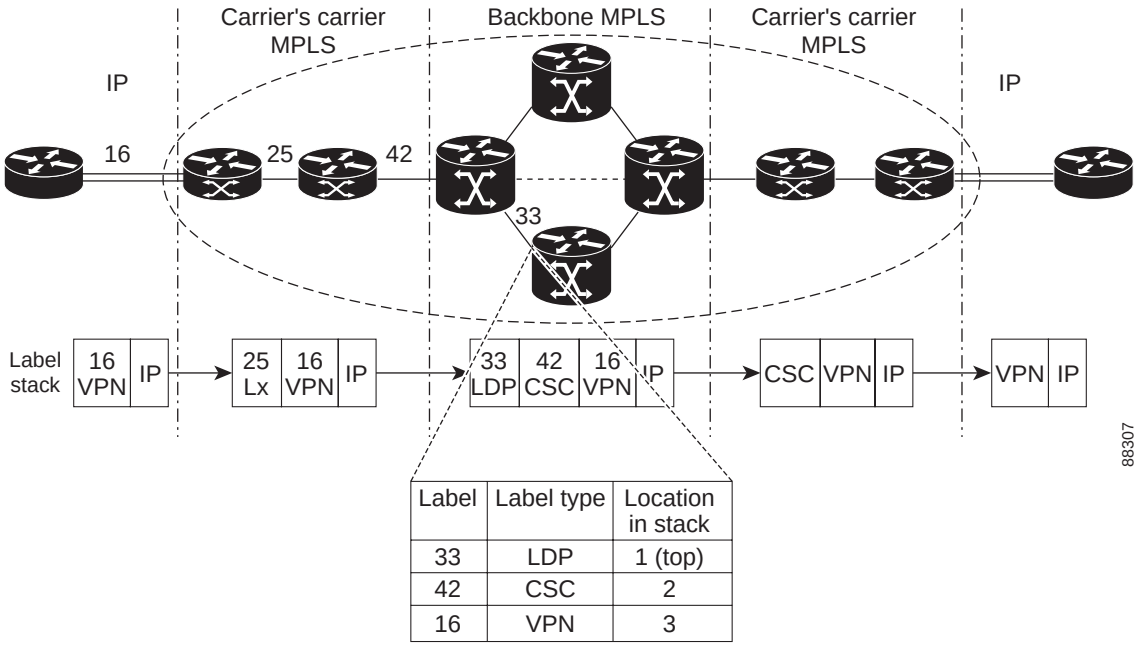
- Lb4–Lb6 represents the fourth to the sixth MPLS label. LSRs in an MPLS cloud add up to six labels to the MPLS label stack.

  MPLS-aware NetFlow captures these label if you indicate 4, 5, or 6, respectively, as labels of interest.

- The B represents miscellaneous bits, as follows:
  - Exp—Three bits reserved for experimental use
  - S—End-of-stack bits, set to 1 for the last entry in the stack and to 0 for all other entries
  - Time To Live (TTL)—Eight bits used to encode a hop count (or time to live) value

Figure 2 shows a sample CSC network topology and the incoming MPLS label stack at LSRs as the packet travels through the network. Figure 2 shows what the stack might look like at a provider core LSR.

Figure 2 Provider and Customer Networks and MPLS Label Imposition



In the example in Figure 2, a hierarchical VPN is set up between two customer edge (CE) routers.

- Traffic flows from the customer router to a provider edge (PE) router, possibly an Internet service provider (ISP). Here, a VPN label (16) is imposed on the inbound IP packet.

- The ISP network eventually connects to an Internet backbone provider where a CSC label (42) is imposed on the label stack.
- As packets traverse the backbone network, an LDP label (33) is imposed on the label stack.

At the inbound interface noted in Figure 2, MPLS-aware NetFlow captures the MPLS label stack and reports that the top label (33) is an LDP label, the second label (42) is a CSC label, and the third label (16) is a VPN label.

With NetFlow and MPLS-aware NetFlow enabled on the P router, you can determine the label type for the specified labels, and the IP address associated with the top label on the incoming interface (see the "MPLS-aware NetFlow Capture of MPLS Labels" section on page 6).

MPLS-aware NetFlow Capture and Display of MPLS Labels

This section contains the following topics:

MPLS-aware NetFlow Capture of MPLS Labels

When you configure the MPLS-aware NetFlow feature, you select the MPLS label positions in the incoming label stack that you are interested in monitoring and using as key flow fields. You can choose to capture up to three labels from positions 1-to-6 in the MPLS label stack. Label positions are counted from the top of the stack. For example, the position of the top label is 1, the position of the next label is 2, and so on. You enter the stack location value as an argument to the **ip flow-cache mpls label-positions** [*label-position-1* [*label-position-2* [*label-position-3*]]] command, where *label-position-n* represents the position of the label on the incoming label stack. For example, the **ip flow-cache mpls label-positions 1 3 4** command configures MPLS-aware NetFlow to capture and export the first (top), the third, and the fourth label. If you enter this command and label stack consists of two MPLS labels, MPLS-aware NetFlow captures only the first (top) label. If some of the labels you requested are not available, they are not captured or reported.

Note For this implementation, MPLS-aware NetFlow allows the capture of up to three labels.

In addition to capturing MPLS labels from the label stack and using them as key flow fields, MPLS-aware NetFlow records the following MPLS label information as nonkey flow fields:

- Type of top label—The type can be any of the following: unknown, TE tunnel mid-point, AToM, VPN, BGP, or LDP.
- The IP address associated with the top label—The route prefix to which the label maps.

Note For this implementation, IP addresses for TE tunnel midpoint and AToM top labels are reported as 0.0.0.0.

MPLS-aware NetFlow is enabled globally on the router. However, NetFlow is enabled per interface and must be enabled in either full or sampled mode on the interfaces where you choose to capture and export MPLS and IP NetFlow data.

Note See Table 1 on page 3 for information on Cisco 12000 Series line cards support for NetFlow full and sampled modes.

MPLS-aware NetFlow Display of MPLS Labels

The MPLS-aware NetFlow feature allows the display of a snapshot of the NetFlow cache, including MPLS flows, on a terminal using the **show ip cache verbose flow** command. For example, output like the following from a provider core router (P router) shows position, value, experimental bits, and end-of-stack bit for each MPLS label of interest. It also shows the type of the top label and the IP address associated with the top label.

```
SrcIf          SrcIPaddress    DstIf          DstIPaddress    Pr TOS Flgs  Pkts
Port Msk AS                    Port Msk AS    NextHop              B/Pk  Active
PO3/0          10.1.1.1        PO5/1          10.2.1.1        01 00  10       9
0100 /0  0                     0200 /0  0     0.0.0.0               100     0.0
Pos:Lbl-Exp-S 1:12305-6-0 (LDP/10.10.10.10) 2:12312-6-1
```

In the example from a P router:

- The value of the top label is 12305.
- The experimental bits value is 6 and the end-of-stack bit is 0.
- The label type is LDP label and the IP address associated with the label is 10.10.10.10.
- The value of the next label from the top is 12312, the experimental bits value is 6, and the end-of-stack bit is 1.

To fully understand and use the information gathered on the P router, you need information from the label forwarding information base (LFIB) on the PE router.

Note The meaning of label for any MPLS label except the top label is not reported by MPLS-aware NetFlow. Therefore, you need to understand your network if you are interested in identifying the meaning of label for other than the top MPLS label.

Using MPLS-aware NetFlow, you can monitor various labels in the MPLS label stack. You can also export this information to a NetFlow collector for further processing with a data analyzer and look at MPLS traffic patterns in your network.

Information Captured and Exported by MPLS-aware NetFlow

MPLS-aware NetFlow captures and reports on other information in addition to MPLS labels. This feature provides per-flow statistics for both incoming IP and MPLS traffic.

- For MPLS traffic, MPLS-aware NetFlow captures and reports up to three labels of interest, type and associated IP address of the top label along with a subset of NetFlow data.
- For IP traffic, MPLS-aware NetFlow provides the regular NetFlow data.

This feature uses Version 9 format to export both IP and MPLS NetFlow data.

MPLS-aware NetFlow provides the following traditional NetFlow per-flow statistics:

- Number of packets
- Number of bytes, counting only IP header and IP payload size

- Time stamp of the first packet
- Time stamp of the last packet

Along with these statistics, MPLS-aware NetFlow exports the following fields for each flow, using Version 9 NetFlow export format:

- Regular NetFlow fields:
  - Source IP address
  - Destination IP address
  - Transport layer protocol
  - Source application port number
  - Destination application port number
  - IP Type of Service (ToS)
  - TCP flags (the result of bitwise OR of TCP flags from all packets in the flow)
  - Input interface
  - Output interface
- Additional fields:
  - Up to three incoming MPLS labels with experimental bits and an end-of-stack bit
  - Positions of the above labels in the label stack
  - Type of the top label
  - An address prefix associated with the top label specific to the label type:
    TE–This is always set to "0.0.0.0" because tunnel label addresses are not supported.
    LDP–The address prefix is the IP address of the next-hop.
    VPN–If the VRFs do not have overlapping IP addresses, the address prefix is the the destination prefix. If the VRFs have overlapping IP addresses the destination prefix given may be ambiguous.

Note Unlike NetFlow, MPLS-aware NetFlow reports IP next-hop, source and destination BGP autonomous system numbers, or source and destination prefix masks as 0 for MPLS packets.

Note If you are exporting MPLS data to a NetFlow collector or a data analyzer, the collector must support NetFlow Version 9 flow export format, and you must configure NetFlow export in Version 9 format on the router.

For more information on IP NetFlow, refer to the *Cisco IOS Switching Services Configuration Guide, Release 12.2*, NetFlow Switching.

How to Configure MPLS-aware NetFlow

This section contains the following procedures for configuring MPLS-aware NetFlow:

- Configure MPLS-aware NetFlow on a Router, page 9 (Required)
- Display MPLS-aware NetFlow Information on a Router, page 10 (Optional)

Configure MPLS-aware NetFlow on a Router

Perform this task to configure MPLS-aware NetFlow on a router.

SUMMARY STEPS

1. **enable**
2. **configure** {**terminal** | **memory** | **network**}
3. **interface** type number
4. **ip route-cache flow** [**sampled**]
5. Repeat Steps 3 and 4 for each interface where you want to configure NetFlow accounting.
6. **exit**
7. **ip flow-cache mpls label-positions** [*label-position-1* [*label-position-2* [*label-position-3*]]]
8. **exit**

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	**configure** {**terminal** | **memory** | **network**} **Example:** `Router# configure terminal`	Enters global configuration mode.
Step 3	**interface** *type number* **Example:** `Router(config)# interface pos 3/0`	Configures an interface type and enters interface configuration mode. • The *type* argument indicates the type of interface to be configured. • The *number* argument is the port, connector, or interface card number. The numbers are assigned at the factory at the time of installation or when added to a system, and can be displayed with the **show interfaces** command.
Step 4	**ip route-cache flow** [**sampled**] **Example:** `Router(config-if)# ip route-cache flow sampled`	Enables NetFlow accounting on the interface. • The sampled keyword enables sampled NetFlow mode for IP and MPLS-aware NetFlow accounting.
Step 5	Repeat Steps 3 and 4 for each interface where you want to configure NetFlow accounting.	–

	Command or Action	Purpose
Step 6	**exit** **Example:** `Router(config-if)# exit`	Exits to global configuration mode.
Step 7	**ip flow-cache mpls label-positions** [*label-position-1* [*label-position-2* [*label-position-3*]]] **Example:** `Router(config)# ip flow-cache mpls label-positions 1 2 3`	Enables MPLS-aware NetFlow. • The *label-position-n* argument identifies the position of an MPLS label of interest in the incoming label stack. Label positions are counted from the top of the stack, starting with 1.
Step 8	**exit** **Example:** `Router(config)# exit`	(Optional) Exits to privileged EXEC mode.

Display MPLS-aware NetFlow Information on a Router

Perform this task to display a snapshot of the MPLS-aware NetFlow cache on a router.

SUMMARY STEPS

1. **enable**
2. **attach** *slot-number*
3. **show ip cache verbose flow**
4. **show ip cache flow**
5. **exit**
6. **show running-config** [**interface** *type number*]
7. **exit**

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	**attach** *slot-number* **Example:** `Router# attach 3`	Accesses the Cisco IOS software image on a line card. • The *slot-number* argument is the slot number of the line card.

	Command or Action	Purpose
Step 3	**show ip cache verbose flow** **Example:** `LC-Slot3# show ip cache verbose flow`	Displays IP and MPLS flow records in the NetFlow cache. Use the **show ip cache verbose flow** command to display MPLS-aware NetFlow cache data.
Step 4	**show ip cache flow** **Example:** `LC-Slot3# show ip cache flow`	Displays a summary of the IP and MPLS flow records in the NetFlow cache. • Use the **show ip cache flow** command to display only the IP flow records of the MPLS flow.
Step 5	**exit** **Example:** `LC-Slot3# exit`	Exits to privileged EXEC mode.
Step 6	**show running-config** [**interface** *type number*] **Example:** `Router# show running-config interface pos 3/0`	Displays the contents of the currently running configuration file. • Use the **show running-config** command to verify that MPLS-aware NetFlow is enabled on the specified router interface.
Step 7	**exit** **Example:** `Router# exit`	(Optional) Exits to user EXEC mode.

Configuration Examples for MPLS-aware NetFlow

This section contains the following configuration examples for MPLS-aware NetFlow:

- Configuring MPLS-aware NetFlow on a Router Example, page 11
- Displaying MPLS-aware NetFlow Information on a Router Examples, page 12

Configuring MPLS-aware NetFlow on a Router Example

The following example shows MPLS-aware NetFlow configured globally and NetFlow enabled on an interface on a P router:

```
configure terminal
ip flow-export version 9 origin-as
ip flow-sampling-mode packet-interval 101
ip flow-cache mpls label-positions 1 2 3
...
interface pos 3/0
 ip route-cache flow sampled
 end
```

To export MPLS-aware NetFlow data from the router, you need to configure NetFlow Version 9. This example shows the configuration of NetFlow Version 9 options for MPLS-aware NetFlow and IP NetFlow data export along with an explanation of what each command configures:

`configure terminal` `ip flow-export version 9 origin-as`	Enters global configuration mode and requests v9 flow export, reports origin-as for IP packets.
`ip flow-export template options sampling`	Specifies the template option sampling configuration.
`ip flow-export template options export-stats`	Reports the number of export packets sent and the number of flows exported.
`ip flow-export template options timeout 5`	Exports template options every 5 minutes.
`ip flow-export template timeout 5`	Resends templates to the collector every 5 minutes.
`ip flow-export destination 10.21.32.25 9996`	Specifies export destination and UDP port.
`ip flow-export source Loopback0`	Specifies export source.
`ip flow-sampling-mode packet-interval 101`	Configures the sampling mode packet interval.
`ip flow-cache mpls label-positions 1 2 3`	Configures MPLS-aware NetFlow to report the top 3 labels.

`interface pos 3/0`
`ip route-cache flow sampled`
`end`
	Enables sampled IP and MPLS-aware NetFlow on interface POS 3/0 and returns to privileged EXEC mode.

Displaying MPLS-aware NetFlow Information on a Router Examples

The following output of the **show ip cache verbose flow** command displays both IP and MPLS portions of flow records in a snapshot of the NetFlow cache:

```
Router# attach 3
LC-Slot3# show ip cache verbose flow
  ...
SrcIf          SrcIPaddress    DstIf          DstIPaddress    Pr TOS Flgs  Pkts
Port Msk AS                    Port Msk AS    NextHop              B/Pk  Active
PO3/0          10.1.1.1        PO5/1          10.2.1.1        01 00  10       9
0100 /0  0                     0200 /0  0     0.0.0.0               100     0.0
Pos:Lbl-Exp-S 1:12305-6-0 (LDP/10.10.10.10) 2:12312-6-1
```

In this example, the value of the top label is 12305, the experimental bits value is 6, and the end-of-stack bit is 0. It is an LDP label and has an associated IP address of 10.10.10.10. The value of the next from the top label is 12312, the experimental bits value is 6, and the end-of-stack bit is 1. The 1 indicates that this is the last MPLS label in the stack.

The following output of the **show ip cache flow** command displays the IP portion of the MPLS flow record in the NetFlow cache:

```
Router# attach 3
LC-Slot3# show ip cache flow

SrcIf         SrcIPaddress    DstIf         DstIPaddress    Pr SrcP DstP  Pkts
PO3/0         10.1.1.1        PO5/1         10.2.1.1        01 0100 0200     9
LC-Slot3#
```

Additional References

For additional information related to MPLS-aware NetFlow, refer to the following references:

Related Documents

Related Topic	Document Title
NetFlow switching description and configuration tasks	NetFlow Switching chapter in the *Cisco IOS Switching Services Configuration Guide*, Release 12.2
Cisco Network Data Analyzer functions, features, and uses	*Network Data Analyzer Installation and User Guide*, Release 3.6
NetFlow concepts and features, guidelines for exporting NetFlow accounting statistics to a NetFlow FlowCollector (NFC) and to the Network Data Analyzer (NDA), high-level examples showing how to deploy these features in different network environments	*NetFlow Services Solutions Guide*
NetFlow v9 export format description and configuration tasks	*NetFlow v9 Export Format*
NetFlow Version 9 flow record format white paper	*Cisco IOS NetFlow Version 9 Flow-Record Format*

Standards

Standards	Title
The IETF working group, IP Flow Information Export (ipfix), is developing a standard that this feature will support.	—

MIBs

MIBs[1]	MIBs Link
• No new or modified MIBs are supported 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.	—

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

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

- **ip flow-cache mpls label-positions**
- **show ip cache verbose flow**

ip flow-cache mpls label-positions

To enable Multiprotocol Label Switching (MPLS)-aware NetFlow, use the **ip flow-cache mpls label-positions** command in global configuration mode. To disable MPLS-aware NetFlow, use the **no** form of this command.

ip flow-cache mpls label-positions [*label-position-1* [*label-position-2* [*label-position-3*]]]

no ip flow-cache mpls label-positions [*label-position-1* [*label-position-2* [*label-position-3*]]]

Syntax Description

label-position-n	Position of an MPLS label in the incoming label stack. Label positions are counted from the top of the stack, starting with 1.

Defaults

This command has no default behavior or values.

Command Modes

Global configuration

Command History

Release	Modification
12.0(24)S	This command was introduced.

Usage Guidelines

Use this command to configure the MPLS-aware NetFlow feature on a label switch router (LSR) and to specify labels of interest in the incoming label stack. Label positions are counted from the top of the stack, starting with 1. The position of the top label is 1, the position of the second label is 2, and so forth.

With MPLS-aware NetFlow enabled on the router, NetFlow collects data for incoming IP as well as for incoming MPLS packets on all interfaces where NetFlow is enabled in full or in sampled mode. MPLS-aware NetFlow is enabled in global configuration mode. NetFlow is enabled per interface.

Examples

The following example shows how to configure MPLS aware NetFlow to capture the first (top), third, and fifth label:

```
Router(config)# ip flow-cache mpls label-positions 1 3 5
```

Related Commands

Command	Description
ip route-cache flow	Enables NetFlow data collection on the interface.
show ip cache flow	Displays a summary of the NetFlow switching statistics.
show ip cache verbose flow	Displays IP and MPLS flow record data in the NetFlow cache.

show ip cache verbose flow

To display IP and Multiprotocol Label Switching (MPLS) flow record data in the NetFlow cache, use the **show ip cache verbose flow** command in privileged EXEC mode.

show ip cache verbose flow

Syntax Description

This command has no keywords or arguments.

Defaults

This command has no default behavior or values.

Command Modes

Privileged EXEC

Command History

Release	Modification
10.0	This command was introduced.
12.0(24)S	MPLS flow records were added to the command output.

Usage Guidelines

Use the **show ip cache verbose flow** command to display both IP and MPLS portions of MPLS flows in the NetFlow cache on a router line card. To display only the IP portion of the flow record in the NetFlow cache, use the **show ip cache flow** command.

Examples

The following example shows the output for both IP and MPLS portions of the flow record in the NetFlow cache:

```
Router# attach 3
LC-Slot3# show ip cache verbose flow

...
SrcIf          SrcIPaddress    DstIf          DstIPaddress    Pr TOS Flgs  Pkts
Port Msk AS                    Port Msk AS    NextHop              B/Pk  Active
PO3/0          10.1.1.1        PO5/1          10.2.1.1        01 00  10       9
0100 /0  0                     0200 /0  0     0.0.0.0               100     0.0
Pos:Lbl-Exp-S 1:12305-6-0 (LDP/10.10.10.10) 2:12312-6-1
```

Table 2 describes the significant fields shown in the display.

Table 2 show ip cache verbose flow Field Descriptions

Field	Description
SrcIf	Interface on which the packet was received.
Port Msk AS	Source Border Gateway Protocol (BGP) autonomous system. This is always set to 0 in MPLS flows.
SrcIPaddress	IP address of the device which transmitted the packet.

Table 2 show ip cache verbose flow Field Descriptions (continued)

Field	Description
DstIf	Interface from which the packet was transmitted.
Port Msk AS	Destination BGP autonomous system. This is always set to 0 in MPLS flows.
DstIPaddress	IP address of the destination device.
NextHop	Specifies the BGP next hop address. This is always set to 0 in MPLS flows.
Pr	IP protocol well-known port number as described in RFC 1340, displayed in hexadecimal format.
B/Pk	Average number of bytes observed for the packets seen for this protocol (total bytes for this protocol or the total number of flows for this protocol for this summary period).
TOS	Type of service.
Flgs	TCP flags (result of bitwise OR of TCP flags from all packets in the flow).
Active	Number of active flows in the NetFlow cache at the time this command was entered.
Pkts	Number of packets switched through this flow.
Pos	Position of the MPLS label in the label stack starting with 1 as the top label.
Lbl	Value given to the MPLS label by the router.
Exp	Value of experimental bit.
S	Value of the end-of-stack bit: Set to 1 for the oldest entry in the stack and to zero for all other entries.
LDP/10.10.10.10	Type and associated IP address for the top label in the MPLS label stack.

Related Commands

Command	Description
ip route-cache flow	Enables NetFlow data collection on the interface.
ip flow-cache mpls label-positions	Enables MPLS-aware NetFlow.
show ip cache flow	Displays a summary of the NetFlow switching statistics.

Glossary

BGP—Border Gateway Protocol. Interdomain routing protocol that replaces EGP. BGP exchanges reachability information with other BGP systems. It is defined by RFC 1163.

EGP—Exterior Gateway Protocol. Internet protocol for exchanging routing information between autonomous systems. Documented in RFC 904. Not to be confused with the general term exterior gateway protocol. EGP is an obsolete protocol that was replaced by BGP.

export packet—A packet from a device (for example, a router) with NetFlow Services enabled that is addressed to another device (for example, a NetFlow collector). This 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—Stream of data traveling between two endpoints across a network (for example, from one LAN station to another). Multiple flows can be transmitted on a single circuit. Packets with the same value for source address, source port, destination address, and destination port might be considered a flow.

flowset—A generic term for a collection of records that follow the packet header in an export packet. The flowset contains information that must be parsed and interpreted by the collector device. There are two types of flowsets: template and data. An export packet contains one or more flowsets, and both template and data flowsets can be mixed within the same export packet.

IPv6—IP version 6. Replacement for the current version of IP (version 4). 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.

label imposition—The act of putting the first label on a packet.

LDP—label distribution protocol. A standard protocol between 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).

MPLS—Multiprotocol Label Switching. Switching method that forwards IP traffic using a label. This label instructs the routers and the switches in the network where to forward the packets based on preestablished IP routing information.

MPLS flow—A unidirectional sequence of MPLS packets that arrives to a router on the same subinterface, has the same source and destination IP addresses, the same Layer 4 protocol, the same TCP/UDP source and destination ports, and the same type of service (TOS) byte in the IP header. A TCP session is an example of a flow.

options template—A special type of template record used to communicate the format of data related to the NetFlow process.

packet header—The first part of an export packet that provides basic information about the packet, such as the NetFlow version, number of records contained within the packet, and sequence numbering, so that lost packets can be detected.

TDP—Tag Distribution Protocol. The Cisco proprietary version of the protocol (label distribution protocol) between MPLS-enabled routers to negotiate the labels (addresses) used to forward packets.

Note Refer to the *Internetworking Terms and Acronyms* for terms not included in this glossary.