



# Configuring NetFlow Lite

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## 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 <http://www.cisco.com/go/cfn>. An account on Cisco.com is not required.

## Prerequisites for NetFlow Lite

NetFlow Lite is only supported on a Catalyst 2960-X Switch with a LAN Base license and on a Catalyst 2960-XR Switch with an IP Lite license. Catalyst 2960-XR is not stackable with the Catalyst 2960-X platform.

The following two targets for attaching a NetFlow Lite monitor are supported:

- Port—Monitor attachment is only supported on physical interfaces and not on logical interfaces, such as EtherChannels. The physical interface could be a routed port or a switched port.

- VLAN—Monitor attachment is supported on VLAN interfaces only (SVI) and not on a Layer 2 VLAN.

## Restrictions for NetFlow Lite

The following are restrictions for NetFlow Lite:

- Monitor restrictions:
  - Monitor attachment is only supported in the ingress direction.
  - One monitor per interface is supported, although multiple exporters per interface are supported.
  - Only permanent and normal cache is supported for the monitor; immediate cache is not supported.
  - Changing any monitor parameter will not be supported when it is applied on any of the interfaces or VLANs.
  - When both the port and VLANs have monitors attached, then VLAN monitor will overwrite the port monitor for traffic coming on the port.
  - Flow monitor type and traffic type (type means IPv4, IPv6, and data link) should be same for the flows to be created.
  - You cannot attach an IP and port-based monitor to an interface at the same time on the switch. A 48-port switch supports a maximum of 48 monitors (IP or port-based) and for 256 SVIs, you can configure up to 256 monitors (IP or port-based).
  - When running the **show flow monitor** *flow\_name* **cache** command, the switch displays cache information from an earlier switch software version (Catalyst 2960-S) with all fields entered as zero. Ignore these fields, as they are inapplicable to the switch.
- Sampler restrictions:
  - Only sampled NetFlow is supported.
  - For both port and VLANs, a total of only 4 samplers (random or deterministic) are supported on the switch.
  - The sampling minimum rate for both modes is 1 out of 32 flows, and the sampling maximum rate for both modes is 1 out of 1022 flows.
  - You must associate a sampler with a monitor while attaching it to an interface. Otherwise, the command will be rejected. Use the **ip flow monitor** *monitor\_name* **sampler** *sampler\_name* **input** interface configuration command to perform this task.
  - When you attach a monitor using a deterministic sampler, every attachment with the same sampler uses one new free sampler from the switch (hardware) out of 4 available samplers. You are not allowed to attach a monitor with any sampler, beyond 4 attachments.

When you attach a monitor using a random sampler, only the first attachment uses a new sampler from the switch (hardware). The remainder of all of the attachments using the same sampler, share the same sampler.

Because of this behavior, when using a deterministic sampler, you can always make sure that the correct number of flows are sampled by comparing the sampling rate and what the switch sends. If the same random sampler is used with multiple interfaces, flows from any interface can always be sampled, and flows from other interfaces can always be skipped.

- Network flows and statistics are collected at the line rate.
- ACL-based NetFlow is not supported.
- Only NetFlow Version 9 is supported for Flexible NetFlow exporter using the *export-protocol* command option. If you configure NetFlow Version 5, this version will be accepted, but the NetFlow Version 5 export functionality is neither currently available nor supported.
- Each switch in a stack (hardware) can support the creation of a maximum of 16,000 flows at any time. But as the flows are periodically pushed to the software cache, the software cache can hold a much larger amount of flows (1048 Kb flows). From the hardware flow cache, every 20 seconds (termed as poll timer), 200 flows (termed as poll entries) are pushed to software.
- The switch supports homogeneous stacking, but does not support mixed stacking.

## Information about Flexible NetFlow

### NetFlow Lite Overview

With NetFlow Lite, traffic is processed and packets are classified into flows. New flows are inserted in the NetFlow table, and statistics are automatically updated. You must configure both ingress and egress NetFlow monitoring. The network services module supports one monitor per interface per direction.

NetFlow Lite has these components:

- Records are combinations of key and nonkey fields assigned to monitor NetFlow Lite monitors to define the cache used to store data.
- Flow monitors are applied to interfaces to perform network traffic monitoring. A flow monitor includes a user-defined record, an optional flow exporter, and a cache that is automatically created when the monitor is applied to the first interface. The switch supports normal caches that age out according to settings.
- Flow exporters export the data in the flow monitor cache to a remote system, such as a server running NetFlow collector.
- Flow samplers reduce the load that NetFlow Lite puts on the networking device to monitor traffic by limiting the number of packets that are analyzed.

You can configure unidirectional flow (destination or source-address based flows), and you can also configure flow aging. These features are supported on the network services module:

- You can configure collection statistics for Layer 2-switched (nonrouting) traffic, Layer 3 IPv4 and IPv6 traffic, and Layer 4 TCP, IGMP, and ICMP traffic.
- NetFlow counting, maintenance, troubleshooting (debugging commands).
- NetFlow analysis is performed on traffic crossing the physical interfaces on the network services module. The switch processes egress (outbound) traffic after forwarding decisions are performed. You can force locally switched or routed traffic through service module ports by configuring private VLANs or protected ports.

## Flow Records

A flow record defines the keys that NetFlow Lite uses to identify packets in the flow, as well as other fields of interest that NetFlow Lite gathers for the flow. You can define a flow record with any combination of keys and fields of interest.

A flow record also defines the types of counters gathered per flow. You can configure 64-bit packet or byte counters.

### NetFlow Predefined Records

Flexible NetFlow includes several predefined records that you can use to start monitoring traffic in your network. The predefined records are available to help you quickly deploy Flexible NetFlow and are easier to use than user-defined flow records. You can choose from a list of already defined records that may meet the needs for network monitoring. As Flexible NetFlow evolves, popular user-defined flow records will be made available as predefined records to make them easier to implement.

The predefined records ensure backward compatibility with your existing NetFlow collector configurations for the data that is exported. Each of the predefined records has a unique combination of key and nonkey fields that offer you the built-in ability to monitor various types of traffic in your network without customizing Flexible NetFlow on your router.

Two of the predefined records (NetFlow original and NetFlow IPv4/IPv6 original output), which are functionally equivalent, emulate original (ingress) NetFlow and the Egress NetFlow Accounting feature in original NetFlow, respectively. Some of the other Flexible NetFlow predefined records are based on the aggregation cache schemes available in original NetFlow. The Flexible NetFlow predefined records that are based on the aggregation cache schemes available in original NetFlow do not perform aggregation. Instead each flow is tracked separately by the predefined records.

### User-Defined Records

Flexible NetFlow enables you to define your own records for a Flexible NetFlow flow monitor cache by specifying the key and nonkey fields to customize the data collection to your specific requirements. When you define your own records for a Flexible NetFlow flow monitor cache, they are referred to as *user-defined records*. The values in nonkey fields are added to flows to provide additional information about the traffic in the flows. A change in the value of a nonkey field does not create a new flow. In most cases the values for nonkey fields are taken from only the first packet in the flow. Flexible NetFlow enables you to capture counter values such as the number of bytes and packets in a flow as nonkey fields.

Flexible NetFlow adds a new Version 9 export format field type for the header and packet section types. Flexible NetFlow will communicate to the NetFlow collector the configured section sizes in the corresponding Version 9 export template fields. The payload sections will have a corresponding length field that can be used to collect the actual size of the collected section.

### NetFlow Lite Match Parameters

You can match these key fields for the flow record:

- IPv4 or IPv6 destination address
- Datalink fields (source and destination MAC address, and MAC ethertype (type of networking protocol)).

- Transport field source and destination ports to identify the type of application: ICMP, IGMP, or TCP traffic.

The following table describes NetFlow Lite match parameters. You must configure at least one of the following match parameters for the flow records.

**Table 1: Match Parameters**

Command	Purpose
<b>match datalink</b> { <b>ethertype</b>   <b>mac</b> { <b>destination address input</b>   <b>source address input</b> }}	<p>Specifies a match to datalink or Layer 2 fields. The following command options are available:</p> <ul style="list-style-type: none"> <li>• <b>ethertype</b>—Matches to the ethertype of the packet.</li> <li>• <b>mac</b>—Matches the source or destination MAC address from packets at input.</li> </ul> <p><b>Note</b> When a datalink flow monitor is assigned to an interface or VLAN, it only creates flows for non-IPv6 or non-IPv4 traffic.</p>
<b>match ipv4</b> { <b>destination</b> { <b>address</b> }   <b>protocol</b>   <b>source</b> { <b>address</b> }   <b>tos</b> }	<p>Specifies a match to the IPv4 fields. The following command options are available:</p> <ul style="list-style-type: none"> <li>• <b>destination</b>—Matches to the IPv4 destination address-based fields.</li> <li>• <b>protocol</b>—Matches to the IPv4 protocols.</li> <li>• <b>source</b>—Matches to the IPv4 source address based fields.</li> <li>• <b>tos</b>—Matches to the IPv4 Type of Service fields.</li> </ul>
<b>match ipv6</b> { <b>destination</b> { <b>address</b> }   <b>flow-label</b>   <b>protocol</b>   <b>source</b> { <b>address</b> } }	<p>Specifies a match to the IPv6 fields. The following command options are available:</p> <ul style="list-style-type: none"> <li>• <b>destination</b>—Matches to the IPv6 destination address-based fields.</li> <li>• <b>flow-label</b>—Matches to the IPv6 flow-label fields.</li> <li>• <b>protocol</b>—Matches to the IPv6 payload protocol fields.</li> <li>• <b>source</b>—Matches to the IPv6 source address based fields.</li> </ul>

Command	Purpose
<b>match transport</b> { <b>destination-port</b>   <b>source-port</b> }	Specifies a match to the Transport Layer fields. The following command options are available: <ul style="list-style-type: none"> <li>• <b>destination-port</b>—Matches to the transport destination port.</li> <li>• <b>source-port</b>—Matches to the transport source port.</li> </ul>

## NetFlow Lite Collect Parameters

You can collect these key fields in the flow record:

- The total number of bytes, flows or packets sent by the exporter (exporter) or the number of bytes or packets in a 64-bit counter (long).
- The timestamp based on system uptime from the time the first packet was sent or from the time the most recent (last) packet was seen.
- The SNMP index of the input interface. The interface for traffic entering the service module is based on the switch forwarding cache. This field is typically used in conjunction with datalink, IPv4, and IPv6 addresses, and provides the actual first-hop interface for directly connected hosts.
  - A value of 0 means that interface information is not available in the cache.
  - Some NetFlow collectors require this information in the flow record.

The following table describes NetFlow Lite collect parameters.

**Table 2: Collect Parameters**

Command	Purpose
<b>collect counter</b> { <b>bytes</b> { <b>long</b>   <b>permanent</b> }   <b>packets</b> { <b>long</b>   <b>permanent</b> }}	Collects the counter fields total bytes and total packets.
<b>collect flow</b> { <b>sampler</b> }	Collects the flow sampler identifier (ID).
<b>collect interface</b> { <b>input</b> }	Collects the fields from the input interface.
<b>collect timestamp sys-uptime</b> { <b>first</b>   <b>last</b> }	Collects the fields for the time the first packet was seen or the time the most recent packet was last seen (in milliseconds).

Command	Purpose
<b>collect transport tcp flags</b>	Collects the following transport TCP flags: <ul style="list-style-type: none"> <li>• <b>ack</b>—TCP acknowledgement flag</li> <li>• <b>cwr</b>—TCP congestion window reduced flag</li> <li>• <b>ece</b>—TCP ECN echo flag</li> <li>• <b>fin</b>—TCP finish flag</li> <li>• <b>psh</b>—TCP push flag</li> <li>• <b>rst</b>—TCP reset flag</li> <li>• <b>syn</b>—TCP synchronize flag</li> <li>• <b>urg</b>—TCP urgent flag</li> </ul>

## Flow Exporters

Flow exporters export the data in the flow monitor cache to a remote system, such as a server running NetFlow collector, for analysis and storage. Flow exporters are created as separate entities in the configuration. Flow exporters are assigned to flow monitors to provide data export capability for the flow monitors. You can create several flow exporters and assign them to one or more flow monitors to provide several export destinations. You can create one flow exporter and apply it to several flow monitors.

### NetFlow Data Export Format Version 9

The basic output of NetFlow is a flow record. Several different formats for flow records have evolved as NetFlow has matured. The most recent evolution of the NetFlow export format is known as Version 9. The distinguishing feature of the NetFlow Version 9 export format is that it is template-based. Templates provide an extensible design to the record format, a feature that should allow future enhancements to NetFlow services without requiring concurrent changes to the basic flow-record format. Using templates provides several key benefits:

- Third-party business partners who produce applications that provide collector or display services for NetFlow do not have to recompile their applications each time a new NetFlow feature is added. Instead, they should be able to use an external data file that documents the known template formats.
- New features can be added to NetFlow quickly without breaking current implementations.
- NetFlow is “future-proofed” against new or developing protocols because the Version 9 format can be adapted to provide support for them.

The Version 9 export format consists of a packet header followed by one or more template flow or data flow sets. A template flow set provides a description of the fields that will be present in future data flow sets. These

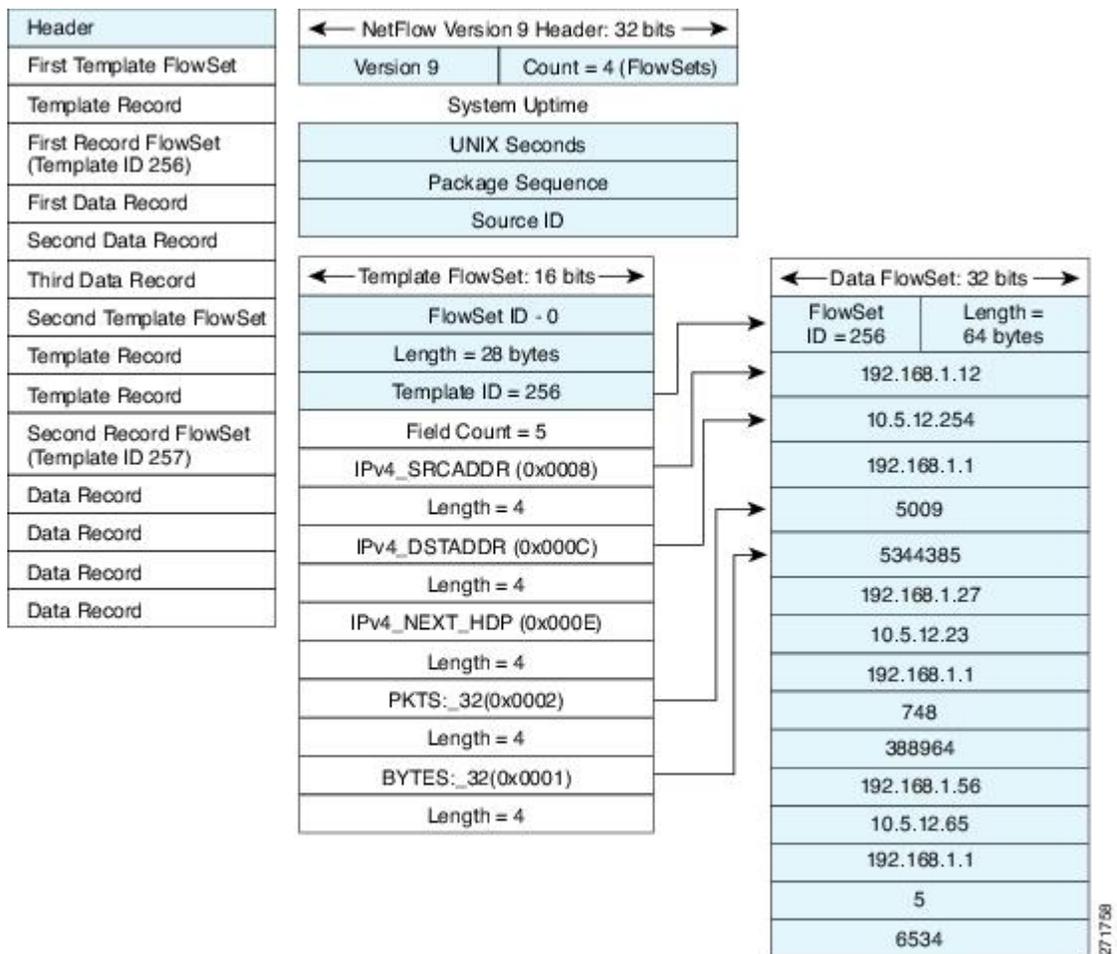
data flow sets may occur later within the same export packet or in subsequent export packets. Template flow and data flow sets can be intermingled within a single export packet, as illustrated in the figure below.

**Figure 1: Version 9 Export Packet**



NetFlow Version 9 will periodically export the template data so the NetFlow collector will understand what data is to be sent and also export the data flow set for the template. The key advantage to Flexible NetFlow is that the user configures a flow record, which is effectively converted to a Version 9 template and then forwarded to the collector. The figure below is a detailed example of the NetFlow Version 9 export format, including the header, template flow, and data flow sets.

**Figure 2: Detailed Example of the NetFlow Version 9 Export Format**



For more information on the Version 9 export format, refer to the white paper titled [Cisco IOS NetFlow Version 9 Flow-Record Format](http://www.cisco.com/en/US/tech/tk648/tk362/technologies_white_paper09186a00800a3db9.shtml), available at this URL: [http://www.cisco.com/en/US/tech/tk648/tk362/technologies\\_white\\_paper09186a00800a3db9.shtml](http://www.cisco.com/en/US/tech/tk648/tk362/technologies_white_paper09186a00800a3db9.shtml).

**Related Topics**

- [Creating a Flow Exporter, on page 14](#)
- [Example: Configuring a Flow Exporter, on page 24](#)

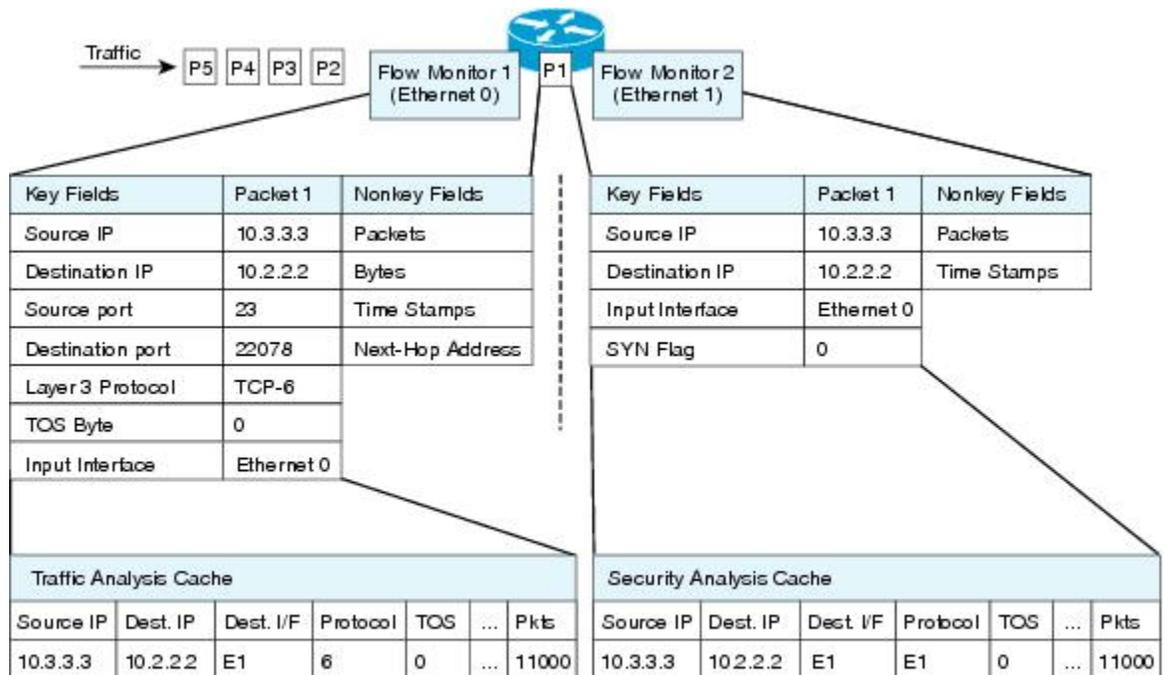
## Flow Monitors

Flow monitors are the Flexible NetFlow component that is applied to interfaces to perform network traffic monitoring.

Flow data is collected from the network traffic and added to the flow monitor cache during the monitoring process based on the key and nonkey fields in the flow record.

Flexible NetFlow can be used to perform different types of analysis on the same traffic. In the figure below, packet 1 is analyzed using a record designed for standard traffic analysis on the input interface and a record designed for security analysis on the output interface.

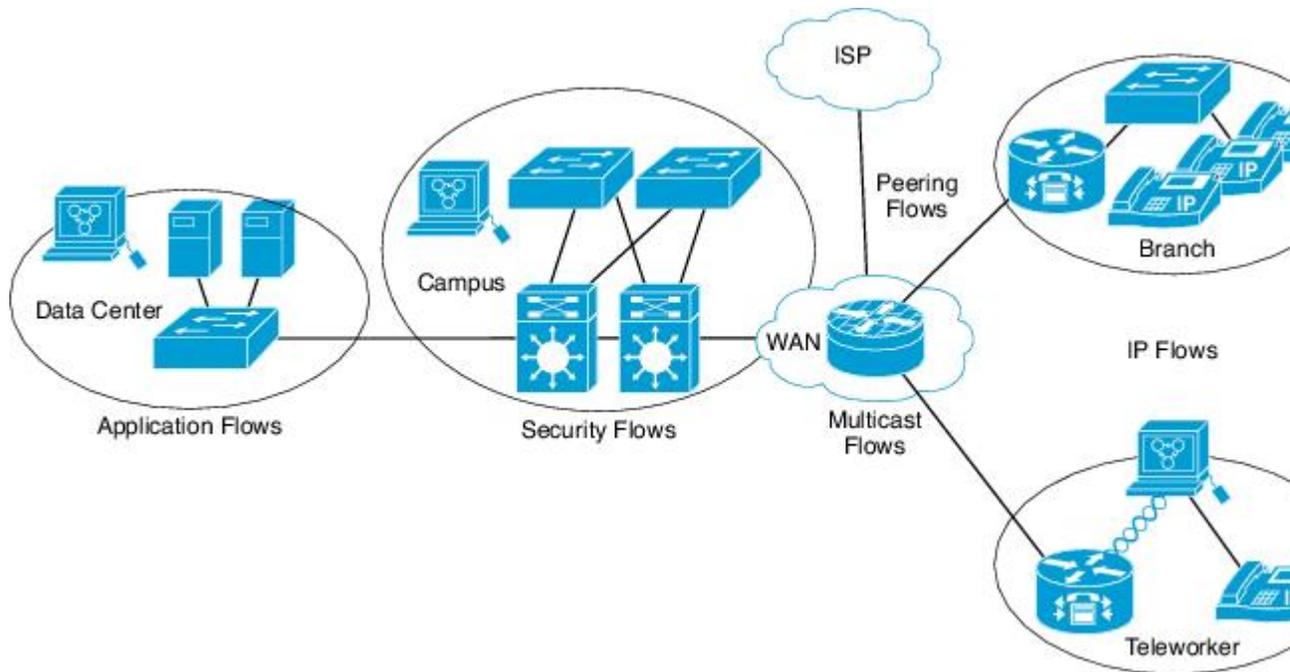
**Figure 3: Example of Using Two Flow Monitors to Analyze the Same Traffic**



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The figure below shows a more complex example of how you can apply different types of flow monitors with custom records.

**Figure 4: Complex Example of Using Multiple Types of Flow Monitors with Custom Records**



There are three types of flow monitor caches. You change the type of cache used by the flow monitor after you create the flow monitor. The three types of flow monitor caches are described in the following sections:

### Normal

The default cache type is "normal". In this mode, the entries in the cache are aged out according to the timeout active and timeout inactive settings. When a cache entry is aged out, it is removed from the cache and exported via any exporters configured.

### Permanent

A cache of type "permanent" never ages out any flows. A permanent cache is useful when the number of flows you expect to see is low and there is a need to keep long-term statistics on the router. For example, if the only key field in the flow record is the 8-bit IP ToS field, only 256 flows can be monitored. To monitor the long-term usage of the IP ToS field in the network traffic, you can use a permanent cache. Permanent caches are useful for billing applications and for an edge-to-edge traffic matrix for a fixed set of flows that are being tracked. Update messages will be sent periodically to any flow exporters configured according to the "timeout update" setting.



**Note** When a cache becomes full in permanent mode, new flows will not be monitored. If this occurs, a "Flows not added" message will appear in the cache statistics.

**Note**

A permanent cache uses update counters rather than delta counters. This means that when a flow is exported, the counters represent the totals seen for the full lifetime of the flow and not the additional packets and bytes seen since the last export was sent.

**Related Topics**

[Creating a Flow Monitor](#)

[Example: Adding a Sampler to a Flow Monitor When a Flow Monitor Is Already Enabled, on page 25](#)

## Flow Samplers

Flow samplers are created as separate components in a router's configuration. Flow samplers are used to reduce the load on the device that is running NetFlow Lite by limiting the number of packets that are selected for analysis.

Samplers use random sampling techniques (modes); that is, a randomly selected sampling position is used each time a sample is taken.

Samplers use either random or deterministic sampling techniques (modes):

- Deterministic--The same sampling position is used each time a sample is taken.
- Random--A randomly selected sampling position is used each time a sample is taken.

Flow sampling exchanges monitoring accuracy for router performance. When you apply a sampler to a flow monitor, the overhead load on the router of running the flow monitor is reduced because the number of packets that the flow monitor must analyze is reduced. The reduction in the number of packets that are analyzed by the flow monitor causes a corresponding reduction in the accuracy of the information stored in the flow monitor's cache.

Samplers are combined with flow monitors when they are applied to an interface with the **ip flow monitor** command.

**Related Topics**

[Creating a Sampler](#)

[Example: Configuring and Enabling a Flow Sampler, on page 25](#)

[Example: Adding a Sampler to a Flow Monitor When a Flow Monitor Is Already Enabled, on page 25](#)

## Stacking

The switch supports homogeneous stacking, but does not support mixed stacking.

Each stack member has NetFlow information that operates as if they are a standalone switch. After entering a **show** CLI EXEC command, the master switch queries stack members to obtain their information. During an export, the member switches send the flow packets to the master switch, since member switches cannot route packets. Therefore, export always occurs from the master switch.

During a switchover, previous monitor configurations are not applied, and the new master switch synchronizes the configuration to all stack members. Member switches reapply the configuration on the respective stack members.

## Default Settings

The following table lists the NetFlow Lite default settings for the switch.

**Table 3: Default NetFlow Lite Settings**

Setting	Default
Flow active timeout	1800 seconds  <b>Note</b> The default value for this setting may be too high for your specific NetFlow Lite configuration. You may want to consider changing it to a lower value of 180 or 300 seconds.
Flow timeout inactive	Enabled, 30 seconds
Flow update timeout	1800 seconds
Default cache size	16640 bits

## How to Configure NetFlow Lite

To configure NetFlow Lite, follow these general steps:

- 1 Create a flow record by specifying keys and non-key fields to the flow.
- 2 Create an optional flow exporter by specifying the protocol and transport destination port, destination, and other parameters.
- 3 Create a flow monitor based on the flow record and flow exporter.
- 4 Create an optional sampler.
- 5 Apply the flow monitor to a Layer 2 port, Layer 3 port, or VLAN.

## Configuring a Flow Record

Perform this task to configure a customized flow record.

Customized flow records are used to analyze traffic data for a specific purpose. A customized flow record must have at least one **match** criterion for use as the key field and typically has at least one **collect** criterion for use as a monkey field.

There are hundreds of possible permutations of customized flow records. This task shows the steps that are used to create one of the possible permutations. Modify the steps in this task as appropriate to create a customized flow record for your requirements.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **flow record** *record-name*
4. **description** *description*
5. **match** {*ipv4* | *ipv6*} {*destination* | *source*} **address**
6. Repeat Step 5 as required to configure additional key fields for the record.
7. **collect interface** {*input* | *output*}
8. Repeat Step 7 as required to configure additional nonkey fields for the record.
9. **end**
10. **show flow record** *record-name*
11. **show running-config flow record** *record-name*

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>flow record</b> <i>record-name</i>  <b>Example:</b> Device(config)# flow record FLOW-RECORD-1	Creates a flow record and enters Flexible NetFlow flow record configuration mode. <ul style="list-style-type: none"> <li>• This command also allows you to modify an existing flow record.</li> </ul>
<b>Step 4</b>	<b>description</b> <i>description</i>  <b>Example:</b> Device(config-flow-record)# description Used for basic traffic analysis	(Optional) Creates a description for the flow record.

	Command or Action	Purpose
<b>Step 5</b>	<b>match</b> {ipv4   ipv6} {destination   source} address  <b>Example:</b> <pre>Device(config-flow-record)# match ipv4 destination address</pre>	<b>Note</b> This example configures the IPv4 destination address as a key field for the record. For information about the other key fields available for the <b>match ipv4</b> command, and the other <b>match</b> commands that are available to configure key fields, refer to the <i>Cisco IOS Flexible NetFlow Command Reference</i> .
<b>Step 6</b>	Repeat Step 5 as required to configure additional key fields for the record.	—
<b>Step 7</b>	<b>collect interface</b> {input   output}  <b>Example:</b> <pre>Device(config-flow-record)# collect interface input</pre>	Configures the input interface as a nonkey field for the record.  <b>Note</b> This example configures the input interface as a nonkey field for the record. For information on the other <b>collect</b> commands that are available to configure nonkey fields, refer to the <i>Cisco IOS Flexible NetFlow Command Reference</i> .
<b>Step 8</b>	Repeat Step 7 as required to configure additional nonkey fields for the record.	—
<b>Step 9</b>	<b>end</b>  <b>Example:</b> <pre>Device(config-flow-record)# end</pre>	Exits Flexible NetFlow flow record configuration mode and returns to privileged EXEC mode.
<b>Step 10</b>	<b>show flow record</b> record-name  <b>Example:</b> <pre>Device# show flow record FLOW_RECORD-1</pre>	(Optional) Displays the current status of the specified flow record.
<b>Step 11</b>	<b>show running-config flow record</b> record-name  <b>Example:</b> <pre>Device# show running-config flow record FLOW_RECORD-1</pre>	(Optional) Displays the configuration of the specified flow record.

## Creating a Flow Exporter

You can create a flow export to define the export parameters for a flow.



**Note** Each flow exporter supports only one destination. If you want to export the data to multiple destinations, you must configure multiple flow exporters and assign them to the flow monitor.

You can export to a destination using IPv4 address.

## SUMMARY STEPS

1. **configure terminal**
2. **flow exporter** *name*
3. **description** *string*
4. **destination** {*ipv4-address*} [**vrf** *vrf-name*]
5. **dscp** *value*
6. **source** { *source type* }
7. **transport udp** *number*
8. **ttl** *seconds*
9. **export-protocol** {*netflow-v9*}
10. **end**
11. **show flow exporter** [**name** *record-name*]
12. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> Switch# <b>configure terminal</b>	Enters the global configuration mode.
<b>Step 2</b>	<b>flow exporter</b> <i>name</i>  <b>Example:</b> Switch(config)# <b>flow exporter ExportTest</b>	Creates a flow exporter and enters flow exporter configuration mode.
<b>Step 3</b>	<b>description</b> <i>string</i>  <b>Example:</b> Switch(config-flow-exporter)# <b>description ExportV9</b>	(Optional) Describes this flow record as a maximum 63-character string.

	Command or Action	Purpose
Step 4	<b>destination</b> { <i>ipv4-address</i> } [ <i>vrf vrf-name</i> ]  <b>Example:</b> <pre>Switch(config-flow-exporter)# destination 192.0.2.1 (IPv4 destination)</pre>	Sets the IPv4 destination address or hostname for this exporter.
Step 5	<b>dscp</b> <i>value</i>  <b>Example:</b> <pre>Switch(config-flow-exporter)# dscp 0</pre>	(Optional) Specifies the differentiated services codepoint value. The range is from 0 to 63. The default is 0.
Step 6	<b>source</b> { <i>source type</i> }  <b>Example:</b> <pre>Switch(config-flow-exporter)# source gigabitEthernet1/0/1</pre>	(Optional) Specifies the interface to use to reach the NetFlow collector at the configured destination. The following interfaces can be configured as source:
Step 7	<b>transport udp</b> <i>number</i>  <b>Example:</b> <pre>Switch(config-flow-exporter)# transport udp 200</pre>	(Optional) Specifies the UDP port to use to reach the NetFlow collector. The range is from 1 to 65536
Step 8	<b>ttl</b> <i>seconds</i>  <b>Example:</b> <pre>Switch(config-flow-exporter)# ttl 210</pre>	(Optional) Configures the time-to-live (TTL) value for datagrams sent by the exporter. The range is from 1 to 255 seconds. The default is 255.
Step 9	<b>export-protocol</b> { <i>netflow-v9</i> }  <b>Example:</b> <pre>Device(config-flow-exporter)# export-protocol netflow-v9</pre>	Specifies the version of the NetFlow export protocol used by the exporter.
Step 10	<b>end</b>  <b>Example:</b> <pre>Switch(config-flow-record)# end</pre>	Returns to privileged EXEC mode.
Step 11	<b>show flow exporter</b> [ <i>name record-name</i> ]  <b>Example:</b> <pre>Switch show flow exporter ExportTest</pre>	(Optional) Displays information about NetFlow flow exporters.

	Command or Action	Purpose
Step 12	<b>copy running-config startup-config</b>  <b>Example:</b>  <pre>Switch# copy running-config startup-config</pre>	(Optional) Saves your entries in the configuration file.

### What to Do Next

Define a flow monitor based on the flow record and flow exporter.

### Related Topics

[Flow Exporters, on page 7](#)

[Example: Configuring a Flow Exporter, on page 24](#)

## Creating a Flow Monitor

Perform this required task to create a customized flow monitor.

Each flow monitor has a separate cache assigned to it. Each flow monitor requires a record to define the contents and layout of its cache entries. These record formats can be a user-defined format. An advanced user can create a customized format using the **flow record** command.

### Before You Begin

If you want to use a customized record, you must create the customized record before you can perform this task. If you want to add a flow exporter to the flow monitor for data export, you must create the exporter before you can complete this task.



#### Note

You must use the **no ip flow monitor** command to remove a flow monitor from all of the interfaces to which you have applied it before you can modify the parameters for the **record** command on the flow monitor. For information about the **ip flow monitor** command, refer to the *Cisco IOS Flexible NetFlow Command Reference*.

## SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **flow monitor** *monitor-name*
4. **description** *description*
5. **record** {*record-name*}
6. **cache** {*entries number* | **timeout** {**active** | **inactive** | **update**} *seconds* | **type** { **normal** } }
7. Repeat Step 6 as required to finish modifying the cache parameters for this flow monitor.
8. **exporter** *exporter-name*
9. **end**
10. **show flow monitor** [[**name**] *monitor-name* [**cache** [**format** {**csv** | **record** | **table**}]]]
11. **show running-config flow monitor** *monitor-name*
12. **copy running-config startup-config**

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Switch> enable	Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Switch# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>flow monitor</b> <i>monitor-name</i>  <b>Example:</b> Switch(config)# flow monitor FLOW-MONITOR-1	Creates a flow monitor and enters Flexible NetFlow flow monitor configuration mode. <ul style="list-style-type: none"> <li>• This command also allows you to modify an existing flow monitor.</li> </ul>
<b>Step 4</b>	<b>description</b> <i>description</i>  <b>Example:</b> Switch(config-flow-monitor)# description Used for basic ipv4 traffic analysis	(Optional) Creates a description for the flow monitor.
<b>Step 5</b>	<b>record</b> { <i>record-name</i> }  <b>Example:</b> Switch(config-flow-monitor)# record FLOW-RECORD-1	Specifies the record for the flow monitor.

	Command or Action	Purpose
<b>Step 6</b>	<p><b>cache</b> {<i>entries number</i>   <b>timeout</b> {<i>active</i>   <i>inactive</i>   <b>update</b>} <i>seconds</i>   <b>type</b> { <b>normal</b> }</p> <p><b>Example:</b></p> <pre>Device(config-flow-monitor)# cache type normal</pre>	<p>(Optional) Modifies the flow monitor cache parameters such as timeout values, number of cache entries, and the cache type.</p> <ul style="list-style-type: none"> <li>• <b>timeout active seconds</b>—Configure the active flow timeout. This defines the granularity of the traffic analysis. The range is from 1 to 604800 seconds. The default is 1800. Typical values are 60 or 300 seconds. See the Configuring Data Export for Cisco IOS Flexible NetFlow with Flow Exporters document for recommended values.</li> <li>• <b>type normal</b>—Configure normal flow removal from the flow cache.</li> </ul> <p><b>Note</b> Although visible in the command line help, the entries keyword and inactive and update timeouts are not supported.</p>
<b>Step 7</b>	Repeat Step 6 as required to finish modifying the cache parameters for this flow monitor.	—
<b>Step 8</b>	<p><b>exporter</b> <i>exporter-name</i></p> <p><b>Example:</b></p> <pre>Switch(config-flow-monitor)# exporter EXPORTER-1</pre>	(Optional) Specifies the name of an exporter that was created previously.
<b>Step 9</b>	<p><b>end</b></p> <p><b>Example:</b></p> <pre>Switch(config-flow-monitor)# end</pre>	Exits Flexible NetFlow flow monitor configuration mode and returns to privileged EXEC mode.
<b>Step 10</b>	<p><b>show flow monitor</b> [[<i>name</i>] <i>monitor-name</i> [<b>cache</b> [<b>format</b> {<i>csv</i>   <i>record</i>   <i>table</i>}]] ]</p> <p><b>Example:</b></p> <pre>Switch# show flow monitor FLOW-MONITOR-2 cache</pre>	(Optional) Displays the status for a Flexible NetFlow flow monitor.
<b>Step 11</b>	<p><b>show running-config flow monitor</b> <i>monitor-name</i></p> <p><b>Example:</b></p> <pre>Switch# show running-config flow monitor FLOW_MONITOR-1</pre>	(Optional) Displays the configuration of the specified flow monitor.
<b>Step 12</b>	<p><b>copy running-config startup-config</b></p> <p><b>Example:</b></p> <pre>Switch# copy running-config</pre>	(Optional) Saves your entries in the configuration file.

	Command or Action	Purpose
	<code>startup-config</code>	

## Applying a Flow to an Interface

You can apply a flow monitor and an optional sampler to an interface.

### SUMMARY STEPS

1. `configure terminal`
2. `interface type`
3. `{ip flow monitor | ipv6 flow monitor}name [[sampler name] {input |output }]`
4. `end`
5. `show flow interface [interface-type number]`
6. `copy running-config startup-config`

### DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> Switch# <code>configure terminal</code>	Enters the global configuration mode.
<b>Step 2</b>	<b>interface type</b>  <b>Example:</b> Switch(config)# <code>interface GigabitEthernet1/0/1</code>	Enters interface configuration mode and configures an interface.  Command parameters for the interface configuration include:  Flexible Net Flow is supported only on the service module 1-Gigabit or 10-Gigabit Ethernet interfaces.  You cannot attach a NetFlow monitor to a port channel interface. If both service module interfaces are part of an EtherChannel, you should attach the monitor to both physical interfaces.
<b>Step 3</b>	<code>{ip flow monitor   ipv6 flow monitor}name [[sampler name] {input  output }]</code>  <b>Example:</b> Switch(config-if)# <code>ip flow monitor MonitorTest input</code>	Associate an IPv4 or an IPv6 flow monitor, and an optional sampler to the interface for input or output packets.  To monitor datalink L2 traffic flows, you would use <b>datalink flow monitor name sampler sampler-name {input}</b> interface command. This specific command associates a datalink L2 flow monitor and required sampler to the interface for input packets. When a datalink flow monitor is assigned to an interface or VLAN record, it only creates flows for non-IPv6 or non-IPv4 traffic.

	Command or Action	Purpose
<b>Step 4</b>	<b>end</b>  <b>Example:</b> Switch(config-flow-monitor)# <b>end</b>	Returns to privileged EXEC mode.
<b>Step 5</b>	<b>show flow interface</b> [ <i>interface-type number</i> ]  <b>Example:</b> Switch# <b>show flow interface</b>	(Optional) Displays information about NetFlow on an interface.
<b>Step 6</b>	<b>copy running-config startup-config</b>  <b>Example:</b> Switch# <b>copy running-config startup-config</b>	(Optional) Saves your entries in the configuration file.

### Related Topics

[Example: Applying a Flow Monitor to an Interface, on page 24](#)

## Creating a Flow Sampler

Perform this required task to configure and enable a flow sampler.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **sampler** *sampler-name*
4. **description** *description*
5. **mode** {**random**} **1 out-of** *window-size*
6. **exit**
7. **interface** *type number*
8. **{ip | ipv6} flow monitor** *monitor-name* [[**sampler**] *sampler-name*] **{input | output}**
9. **end**
10. **show sampler sampler-name**

## DETAILED STEPS

	Command or Action	Purpose
<b>Step 1</b>	<b>enable</b>  <b>Example:</b> Device> enable	Enables privileged EXEC mode.  • Enter your password if prompted.
<b>Step 2</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters global configuration mode.
<b>Step 3</b>	<b>sampler</b> <i>sampler-name</i>  <b>Example:</b> Device(config)# sampler SAMPLER-1	Creates a sampler and enters sampler configuration mode.  • This command also allows you to modify an existing sampler.
<b>Step 4</b>	<b>description</b> <i>description</i>  <b>Example:</b> Device(config-sampler)# description Sample at 50%	(Optional) Creates a description for the flow sampler.
<b>Step 5</b>	<b>mode</b> {random} 1 out-of <i>window-size</i>  <b>Example:</b> Device(config-sampler)# mode random 1 out-of 2	Specifies the sampler mode and the flow sampler window size.  • The range for the <i>window-size</i> argument is from 32 to 1022.
<b>Step 6</b>	<b>exit</b>  <b>Example:</b> Device(config-sampler)# exit	Exits sampler configuration mode and returns to global configuration mode.
<b>Step 7</b>	<b>interface</b> <i>type number</i>  <b>Example:</b> Device(config)# interface GigabitEthernet 0/0/0	Specifies an interface and enters interface configuration mode.
<b>Step 8</b>	{ip   ipv6} <b>flow monitor</b> <i>monitor-name</i> [[ <b>sampler</b> ] <i>sampler-name</i> ] {input   output}  <b>Example:</b> Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 input	Assigns the flow monitor and the flow sampler that you created to the interface to enable sampling.

	Command or Action	Purpose
Step 9	<b>end</b>  <b>Example:</b> Device(config-if)# end	Exits interface configuration mode and returns to privileged EXEC mode.
Step 10	<b>show sampler sampler-name</b>  <b>Example:</b> Device# show sampler SAMPLER-1	Displays the status and statistics of the flow sampler that you configured and enabled.

## Monitoring NetFlow Lite

The commands in the following table can be used to monitor NetFlow Lite.

**Table 4: NetFlow Lite Monitoring Commands**

Command	Purpose
<b>show flow record</b>	Displays the status of the flow records.
<b>show flow exporter</b> <i>exporter-name</i>	Displays the status of a flow exporter.
<b>show flow monitor</b> <i>monitor -name</i>	Displays the current status of a flow monitor.
<b>show flow interface</b> <i>interface-id</i>	Verifies that the NetFlow Lite is configured on the interface.
<b>show flow monitor name</b> <i>monitor -name cache</i>	Displays data in the flow monitor cache.
<b>show sampler</b> <i>sampler -name</i>	Displays the current status of a flow sampler.

## Configuration Examples for NetFlow Lite

### Example: Configuring a Flow

This example shows how to create a flow and apply it to an interface:

```
Switch# configure terminal
```

Enter configuration commands, one per line. End with CNTL/Z.

```
Switch(config)# flow export export1
Switch(config-flow-exporter)# destination 10.0.101.254
Switch(config-flow-exporter)# transport udp 2055
Switch(config-flow-exporter)# exit
Switch(config)# flow record record1
Switch(config-flow-record)# match ipv4 source address
Switch(config-flow-record)# match ipv4 destination address
Switch(config-flow-record)# match ipv4 protocol
Switch(config-flow-record)# match transport source-port
Switch(config-flow-record)# match transport destination-port
Switch(config-flow-record)# collect counter byte long
Switch(config-flow-record)# collect counter packet long
Switch(config-flow-record)# collect timestamp absolute first
Switch(config-flow-record)# collect timestamp absolute last
Switch(config-flow-record)# exit
Switch(config)# flow monitor monitor1
Switch(config-flow-monitor)# record record1
Switch(config-flow-monitor)# exporter export1
Switch(config-flow-monitor)# exit
Switch(config)# interface tenGigabitEthernet 1/0/1
Switch(config-if)# ip flow monitor monitor1 input
Switch(config-if)# end
```

### Related Topics

[Creating a Flow Record](#)  
[Flow Records](#)

## Example: Configuring a Flow Exporter

This example shows how to configure the flow exporter:

```
Switch(config)# flow exporter QoS-Collector
Switch(config-flow-exporter)# description QoS Collector Bldg 19
Switch(config-flow-exporter)# destination 172.20.244.28
Switch(config-flow-exporter)# source vlan 1
Switch(config-flow-exporter)# dscp 3
Switch(config-flow-exporter)# transport udp 2055
Switch(config-flow-exporter)# end
```

### Related Topics

[Creating a Flow Exporter, on page 14](#)  
[Flow Exporters, on page 7](#)

## Example: Applying a Flow Monitor to an Interface

This example shows how to apply a flow monitor to an interface:

```
Switch(config)# interface gigabitEthernet 1/1/2
Switch(config-if)# ip flow monitor FLOW-MONITOR-1 input
Switch(config-if)# end
```

### Related Topics

[Applying a Flow to an Interface, on page 20](#)

## Example: Adding a Sampler to a Flow Monitor When a Flow Monitor Is Already Enabled

The following example shows what happens when you try to add a sampler to a flow monitor that has already been enabled on an interface without a sampler:

```
Device(config)# interface GigabitEthernet 0/0/0
Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-2 input
% Flow Monitor: Flow Monitor 'FLOW-MONITOR-1' is already on in full mode and cannot be
enabled with a sampler.
```

The following example shows how to remove the flow monitor from the interface so that it can be enabled with the sampler:

```
Device(config)# interface GigabitEthernet 0/0/0
Device(config-if)# no ip flow monitor FLOW-MONITOR-1 input
Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-2 input
```

### Related Topics

[Creating a Flow Monitor](#)

[Flow Monitors, on page 9](#)

[Creating a Sampler](#)

[Flow Samplers, on page 11](#)

## Example: Configuring and Enabling a Flow Sampler

This example shows how to configure and enable a flow sampler:

```
Switch(config)# sampler SAMPLER-1
Switch(config-sampler)# description Sample at 50
Switch(config-sampler)# mode random 1 out-of 50
Switch(config-sampler)# exit
Switch(config)# interface gigabitethernet 1/1/2
Switch(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLE-1 input
```

### Related Topics

[Creating a Sampler](#)

[Flow Samplers, on page 11](#)

# Additional References

## Related Documents

Related Topic	Document Title
Flexible NetFlow CLI Commands	<i>Flexible NetFlow Command Reference, Cisco IOS XE Release 3SE (Cisco WLC 5700 Series)</i>

## Error Message Decoder

Description	Link
To help you research and resolve system error messages in this release, use the Error Message Decoder tool.	<a href="https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi">https://www.cisco.com/cgi-bin/Support/Errordecoder/index.cgi</a>

## Standards and RFCs

Standard/RFC	Title
RFC 3954	Cisco Systems NetFlow Services Export Version 9

## MIBs

MIB	MIBs Link
All supported MIBs for this release.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: <a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a>

**Technical Assistance**

Description	Link
<p>The Cisco Support website provides extensive online resources, including documentation and tools for troubleshooting and resolving technical issues with Cisco products and technologies.</p> <p>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.</p> <p>Access to most tools on the Cisco Support website requires a Cisco.com user ID and password.</p>	<a href="http://www.cisco.com/support">http://www.cisco.com/support</a>

## Feature Information for Flexible NetFlow

Release	Modification
Cisco IOS 15.0(2)EX1	This feature was introduced.

