



# Using Flexible NetFlow Flow Sampling

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**Last Updated: November 19, 2012**

This document contains information about and instructions for configuring sampling to reduce the CPU overhead of analyzing traffic with Flexible NetFlow.

NetFlow is a Cisco technology that provides statistics on packets flowing through a router. NetFlow is the standard for acquiring IP operational data from IP networks. NetFlow provides data to support network and security monitoring, network planning, traffic analysis, and IP accounting.

Flexible NetFlow improves on original NetFlow by adding the capability to customize the traffic analysis parameters for your specific requirements. Flexible NetFlow facilitates the creation of more complex configurations for traffic analysis and data export through the use of reusable configuration components.

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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 [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

## Prerequisites for Using Flow Sampling

- The networking device must be running a Cisco release that supports Flexible NetFlow.



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### IPv4 Traffic

- The networking device must be configured for IPv4 routing.
- One of the following must be enabled on your router and on any interfaces on which you want to enable Flexible NetFlow: Cisco Express Forwarding or distributed Cisco Express Forwarding.

### IPv6 Traffic

- The networking device must be configured for IPv6 routing.
- One of the following must be enabled on your router and on any interfaces on which you want to enable Flexible NetFlow: Cisco Express Forwarding IPv6 or distributed Cisco Express Forwarding IPv6.

## Information About Flexible NetFlow Samplers

- [Flow Samplers, page 2](#)

## 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 Flexible NetFlow by limiting the number of packets that are selected for analysis.

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.

## How to Configure Flexible NetFlow Flow Sampling

Flow sampling reduces the CPU overhead of analyzing traffic with Flexible NetFlow by reducing the number of packets that are analyzed.



### Note

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Only the keywords and arguments required for the Flexible NetFlow commands used in these tasks are explained in these tasks. For information about the other keywords and arguments available for these Flexible NetFlow commands, refer to the *Cisco IOS Flexible NetFlow Command Reference*.

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- [Configuring a Flow Monitor, page 3](#)
- [Configuring and Enabling Flow Sampling, page 4](#)

## Configuring a Flow Monitor

Samplers are applied to an interface in conjunction with a flow monitor. You must create a flow monitor to configure the types of traffic that you want to analyze before you can enable sampling. To configure a flow monitor, perform the following required task.

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. The record format can be one of the predefined record formats, or an advanced user may create his or her own record format using the **collect** and **match** commands in Flexible NetFlow flow record configuration mode.



### 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.

### SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **flow monitor** *monitor-name*
4. **description** *description*
5. **record** {*record-name* | **netflow-original** | **netflow** {**ipv4** | **ipv6**} *record* [**peer**]}
6. **end**

### DETAILED STEPS

|        | Command or Action   | Purpose  |
|--------|---|--|
| Step 1 | <b>enable</b><br><br><b>Example:</b><br>Device> enable  | Enables privileged EXEC mode. <ul style="list-style-type: none"> <li>• Enter your password if prompted.</li> </ul>   |
| Step 2 | <b>configure terminal</b><br><br><b>Example:</b><br>Device# configure terminal                                | Enters global configuration mode.  |
| Step 3 | <b>flow monitor</b> <i>monitor-name</i><br><br><b>Example:</b><br>Device(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> |

| Command or Action  | Purpose   |
|--|---|
| <p><b>Step 4</b> <code>description</code> <i>description</i></p> <p><b>Example:</b></p> <pre>Device(config-flow-monitor)# description Used for basic traffic analysis</pre>  | (Optional) Creates a description for the flow monitor.                                      |
| <p><b>Step 5</b> <code>record</code> {<i>record-name</i>   <b>netflow-original</b>   <b>netflow</b> {<b>ipv4</b>   <b>ipv6</b>} <i>record</i> [<b>peer</b>]}</p> <p><b>Example:</b></p> <pre>Device(config-flow-monitor)# record netflow ipv4 original-input</pre> | Specifies the record for the flow monitor.  |
| <p><b>Step 6</b> <code>end</code></p> <p><b>Example:</b></p> <pre>Device(config-flow-monitor)# end</pre>   | Exits Flexible NetFlow flow monitor configuration mode and returns to privileged EXEC mode. |

## Configuring and Enabling Flow Sampling

To configure and enable a flow sampler, perform the following required task.

### SUMMARY STEPS

1. `enable`
2. `configure terminal`
3. `sampler` *sampler-name*
4. `description` *description*
5. `mode` {**deterministic** | **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  |
|--------|--|--|
| Step 1 | <p><b>enable</b></p> <p><b>Example:</b></p> <pre>Device&gt; enable</pre>   | <p>Enables privileged EXEC mode.</p> <ul style="list-style-type: none"> <li>Enter your password if prompted.</li> </ul>  |
| Step 2 | <p><b>configure terminal</b></p> <p><b>Example:</b></p> <pre>Device# configure terminal</pre>  | <p>Enters global configuration mode.</p>   |
| Step 3 | <p><b>sampler <i>sampler-name</i></b></p> <p><b>Example:</b></p> <pre>Device(config)# sampler SAMPLER-1</pre>  | <p>Creates a sampler and enters sampler configuration mode.</p> <ul style="list-style-type: none"> <li>This command also allows you to modify an existing sampler.</li> </ul>            |
| Step 4 | <p><b>description <i>description</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sampler)# description Sample at 50%</pre>                         | <p>(Optional) Creates a description for the flow sampler.</p>  |
| Step 5 | <p><b>mode {deterministic   random} 1 out-of <i>window-size</i></b></p> <p><b>Example:</b></p> <pre>Device(config-sampler)# mode random 1 out-of 2</pre> | <p>Specifies the sampler mode and the flow sampler window size.</p> <ul style="list-style-type: none"> <li>The range for the <i>window-size</i> argument is from 2 to 32,768.</li> </ul> |
| Step 6 | <p><b>exit</b></p> <p><b>Example:</b></p> <pre>Device(config-sampler)# exit</pre>  | <p>Exits sampler configuration mode and returns to global configuration mode.</p>  |
| Step 7 | <p><b>interface <i>type number</i></b></p> <p><b>Example:</b></p> <pre>Device(config)# interface GigabitEthernet 0/0/0</pre>                             | <p>Specifies an interface and enters interface configuration mode.</p>   |

| Command or Action   | Purpose  |
|---|--|
| <p><b>Step 8</b> {ip   ipv6} flow monitor <i>monitor-name</i> [[<b>sampler</b>] <i>sampler-name</i>] {input   output}</p> <p><b>Example:</b></p> <pre>Device(config-if)# ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 input</pre> | <p>Assigns the flow monitor and the flow sampler that you created to the interface to enable sampling.</p> |
| <p><b>Step 9</b> end</p> <p><b>Example:</b></p> <pre>Device(config-if)# end</pre>   | <p>Exits interface configuration mode and returns to privileged EXEC mode.</p>                             |
| <p><b>Step 10</b> show sampler <i>sampler-name</i></p> <p><b>Example:</b></p> <pre>Device# show sampler SAMPLER-1</pre>   | <p>Displays the status and statistics of the flow sampler that you configured and enabled.</p>             |

## Configuration Examples for Using Flexible NetFlow Flow Sampling

- [Example: Configuring and Enabling a Deterministic Sampler for IPv4 Traffic, page 6](#)
- [Example: Configuring and Enabling a Deterministic Sampler for IPv6 Traffic, page 7](#)
- [Example: Adding a Sampler to a Flow Monitor When a Flow Monitor Is Already Enabled, page 8](#)
- [Example: Removing a Sampler from a Flow Monitor, page 8](#)

### Example: Configuring and Enabling a Deterministic Sampler for IPv4 Traffic

The following example shows how to configure and enable deterministic sampling for IPv4 output traffic.

This sample starts in global configuration mode:

```
!
flow monitor FLOW-MONITOR-1
 record netflow ipv4 original-output
 exit
!
sampler SAMPLER-1
 mode deterministic 1 out-of 2
 exit
!
ip cef
!
interface GigabitEthernet 0/0/0
 ip address 172.16.6.2 255.255.255.0
```

```
ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 output
!
```

The following example shows how to configure and enable deterministic sampling for IPv4 input traffic.

This sample starts in global configuration mode:

```
!
flow monitor FLOW-MONITOR-1
 record netflow ipv4 original-input
 exit
!
sampler SAMPLER-1
 mode deterministic 1 out-of 2
 exit
!
ip cef
!
interface GigabitEthernet 0/0/0
 ip address 172.16.6.2 255.255.255.0
 ip flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 input
!
```

## Example: Configuring and Enabling a Deterministic Sampler for IPv6 Traffic

The following example shows how to configure and enable deterministic sampling for IPv6 output traffic.

This sample starts in global configuration mode:

```
!
flow monitor FLOW-MONITOR-2
 record netflow ipv6 original-output
 exit
!
sampler SAMPLER-1
 mode deterministic 1 out-of 2
 exit
!
ip cef
ipv6 cef
!
interface GigabitEthernet 0/0/0
 ipv6 address 2001:DB8:2:ABCD::2/48
 ipv6 flow monitor FLOW-MONITOR-2 sampler SAMPLER-1 output
!
```

The following example shows how to configure and enable deterministic sampling for IPv6 input traffic.

This sample starts in global configuration mode:

```
!
flow monitor FLOW-MONITOR-2
 record netflow ipv6 original-input
 exit
!
sampler SAMPLER-1
 mode deterministic 1 out-of 2
 exit
!
ip cef
ipv6 cef
!
interface GigabitEthernet 0/0/0
 ipv6 address 2001:DB8:2:ABCD::2/48
 ipv6 flow monitor FLOW-MONITOR-1 sampler SAMPLER-1 input
!
```

## 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:

```
Router(config)# interface GigabitEthernet 0/0/0
Router(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:

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

## Example: Removing a Sampler from a Flow Monitor

The following example shows what happens when you try to remove a sampler from a flow monitor on an interface by entering the flow monitor command again without the sampler keyword and argument:

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

The following example shows how to remove the flow monitor that was enabled with a sampler from the interface so that it can be enabled without the sampler:

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

## Additional References

### Related Documents

| Related Topic   | Document Title   |
|---|--|
| Cisco IOS commands  | <a href="#">Cisco IOS Master Commands List, All Releases</a> |
| Flexible NetFlow conceptual and configuration information | <a href="#">Flexible NetFlow Configuration Guide</a>         |
| Configuration commands for Flexible NetFlow               | <a href="#">Cisco IOS Flexible NetFlow Command Reference</a> |



**Standards/RFCs**

| Standard   | Title |
|--|-------|
| No new or modified standards/RFCs are supported by this feature. | --    |

**MIBs**

| MIB  | MIBs Link   |
|------|---|
| None | To locate and download MIBs for selected platforms, Cisco software releases, and feature sets, use Cisco MIB Locator found at the following URL:<br><br><a href="http://www.cisco.com/go/mibs">http://www.cisco.com/go/mibs</a> |

**Technical Assistance**

| Description   | Link  |
|---|---|
| The Cisco Support and Documentation website provides online resources to download documentation, software, and tools. Use these resources to install and configure the software and to troubleshoot and resolve technical issues with Cisco products and technologies. Access to most tools on the Cisco Support and Documentation website requires a Cisco.com user ID and password. | <a href="http://www.cisco.com/cisco/web/support/index.html">http://www.cisco.com/cisco/web/support/index.html</a> |

## Feature Information for Flexible Netflow—Random Sampling

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](http://www.cisco.com/go/cfn). An account on Cisco.com is not required.

**Table 1**      **Feature Information for Flexible Netflow—Random Sampling**

| Feature Name                     | Releases   | Feature Information   |
|----------------------------------|--|---|
| Flexible Netflow—Random Sampling | 12.2(50)SY<br>12.4(20)T<br>Cisco IOS XE Release 3.1S<br>Cisco IOS XE Release 3.2SE | 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 Flexible NetFlow by limiting the number of packets that are selected for analysis. Samplers use either random or deterministic sampling techniques (modes).<br><br>The following commands were introduced or modified: <b>clear sampler</b> , <b>debug sampler</b> , <b>mode</b> , <b>record</b> , <b>sampler</b> , <b>show sampler</b> . |

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