



# Configuring NetFlow

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This chapter describes how to configure the NetFlow feature on Cisco NX-OS devices.

This chapter contains the following sections:

- [Configuring NetFlow - Ingress and Egress, on page 1](#)

## Configuring NetFlow - Ingress and Egress

From Cisco NX-OS Release 10.4(1)F, NetFlow comprises the following configuration procedures:

- **Configuring Ingress NetFlow**
- **Configuring Egress NetFlow** (Supported from Cisco NX-OS Release 10.4(1)F).

## Configuring Ingress NetFlow

### About Ingress NetFlow

Ingress NetFlow identifies packet flows for ingress IP packets and provides statistics based on these packet flows. NetFlow does not require any change to either the packets themselves or to any networking device.

Ingress NetFlow uses flows to provide statistics for accounting, network monitoring, and network planning. A flow is a unidirectional stream of packets that arrives on a source interface (or VLAN) and has the same values for the keys. A key is an identified value for a field within the packet. You create a flow using a flow record to define the unique keys for your flow.

Cisco NX-OS supports the flexible NetFlow feature that enables enhanced network anomalies and security detection. Flexible NetFlow allows you to define an optimal flow record for a particular application by selecting the keys from a large collection of predefined fields.

All key values must match for the packet to count in a given flow. A flow might gather other fields of interest, depending on the export record version that you configure. Flows are stored in the NetFlow cache.

You can export the data that NetFlow gathers for your flow by using a flow exporter and export this data to a remote NetFlow Collector, such as Cisco Stealthwatch. Cisco NX-OS exports a flow as part of a NetFlow export User Datagram Protocol (UDP) datagram under the following circumstances:

- Flows are exported periodically as per the flow timeout value, which defaults to 10 seconds if not configured.

- You have forced the flow to export.

The flow record determines the size of the data to be collected for a flow. The flow monitor combines the flow record and flow exporter with the NetFlow cache information.

Cisco NX-OS can gather NetFlow statistics and analyze all packets on the interface or subinterface.

## Dual-Layer NetFlow Implementation

Unlike other Cisco Nexus platforms, Cisco Nexus 9000 Series switches separate NetFlow processing into two layers:

- The first layer supports per-packet visibility for line-rate traffic. Packets do not need to be sampled and statistically analyzed. Instead, the packets can be processed and aggregated at line rate.
- The second layer enables the gathering of flows at scale. It can maintain hundreds of thousands of flows without losing any flows and periodically exports them to an external collector.

## Flow Records

A flow record defines the keys that NetFlow uses to identify packets and other fields of interest that NetFlow gathers for the flow. You can define a flow record with any combination of keys and fields of interest. Cisco NX-OS supports a rich set of keys. A flow record also defines the types of counters gathered per flow. You can configure 32- or 64-bit packet or byte counters.

The key fields are specified with the **match** keyword. The fields of interest and counters are specified under the **collect** keyword.

Cisco NX-OS enables the following match fields as the defaults when you create a flow record:

- match interface input
- match flow direction

## Flow Exporters

A flow exporter contains network layer and transport layer details for the NetFlow export packet. You can configure the following information in a flow exporter:

- Export destination IP address
- Source interface
- UDP port number (where the NetFlow Collector is listening for NetFlow packets)—The default value is 9995.



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**Note** NetFlow export packets use the IP address that is assigned to the source interface. If the source interface does not have an IP address assigned to it, the flow exporter drops flows that were meant to be exported. The Netflow Exporter source interface and destination IP must use the same VRF.

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Cisco NX-OS exports data to the NetFlow Collector whenever a timeout occurs. You can configure a flush cache timeout (using the **flow timeout** command) to flush the cache and force a flow export.

## Export Format

Cisco NX-OS supports the Version 9 export format. This format supports a more efficient network utilization than the older Version 5 export format and supports IPv6 and Layer 2 fields. In addition, the Version 9 export format supports the full 32-bit SNMP `ifIndex` values at the NetFlow Collector.

## Layer 2 NetFlow Keys

You can define Layer 2 keys in flexible NetFlow records that you can use to capture flows in Layer 2 interfaces. The Layer 2 keys are as follows:

- Source and destination MAC addresses
- Source VLAN ID
- EtherType from the Ethernet frame

You can apply Layer 2 NetFlow to the following interfaces for the ingress direction:

- Switch ports in access mode
- Switch ports in trunk mode
- Layer 2 port channels



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**Note** You cannot apply Layer 2 NetFlow to VLANs, egress interfaces, or Layer 3 interfaces such as VLAN interfaces.

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## Flow Monitors

A flow monitor references the flow record and flow exporter. You apply a flow monitor to an interface.

## NetFlow Output Interface

The NetFlow output interface on Cisco Nexus switches have the following features:

- NetFlow in the **show flow cache** command displays `output_if_id` and exports output interface to the collector.
- The NetFlow output interface for Cisco Nexus platform switches supports both IPv4 and IPv6 traffic flows. However, the NetFlow output interface for Cisco Nexus 9500 platform switches is supported only for IPv4 traffic flows and is not supported for IPv6 traffic flows.
- The **show flow cache** command displays `output_if_id` as `0x0`. However, beginning with Cisco NX-OS Release 10.3(3)F, the **show flow cache** command displays `output_if_id` as `0x0` only if the destination IP address cannot be resolved or is not installed in the routing table or the packet received is control packet.
- NetFlow supports exporting output interface to the collector for IPv4/IPv6 incoming traffic flows, which have Next-Hop as destination interface. The NetFlow export format for `InputInt` and `OutputInt` support the full 32-bit SNMP `ifIndex` values at the NetFlow Collector.
- The NetFlow output interface is not supported for tunnel traffic flows such as MPLS, VXLAN, and GRE.
- For more information on examples for NetFlow output interface, see the [Display Example for Ingress NetFlow, on page 18](#).

## High Availability

Cisco NX-OS supports stateful restarts for NetFlow. After a reboot, Cisco NX-OS applies the running configuration.

The flow cache is not preserved across restarts, and packets that come to the software during restarts cannot be processed.

## Prerequisites for Ingress NetFlow

Ingress NetFlow has the following prerequisites:

- Make sure that you understand the resources required on your device because NetFlow consumes memory and CPU resources.

## Guidelines and Limitations for Ingress NetFlow



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**Note** For scale information, see the release-specific *Cisco Nexus 9000 Series NX-OS Verified Scalability Guide*.

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Ingress NetFlow has the following configuration guidelines and limitations:

- For Cisco Nexus 9300-FX platform switches only, if you add a member to a port channel that is already configured for Layer 2 NetFlow, its NetFlow configuration is removed and the Layer 2 configuration of the port channel is added to it.
- NetFlow is not supported on tunnel interfaces.
- NetFlow is not supported for CPU-transmitted packets.
- Only ingress NetFlow is supported. Egress NetFlow is not supported.
- Flow cache can be cleared per flow type, such as Layer 2, IPv4, and IPv6. It cannot be cleared per flow monitor.
- Flow collection is not performed for ARP traffic.
- You must configure a source interface for the NetFlow Data Export (NDE). If you do not configure a source interface, the flow exporter drops flows that were meant to be exported.
- Layer 2 switched flow monitors are applied only to Layer 2 interfaces. IP and IPv6 flow monitors can be applied to VLANs, SVIs, Layer 3 routed interfaces, or subinterfaces.
- If you change a Layer 2 interface to a Layer 3 interface, or a Layer 3 interface to a Layer 2 interface, the software removes the Layer 2 NetFlow configuration from the interface.
- The same flow monitor cannot be shared with a VLAN and Layer 3 interfaces (for example, physical Layer 3 interface, SVI interface, or Layer 3 subinterface). You must distinguish a VLAN and Layer 3 interface since the ACL is different and cannot be shared. They must be treated as two different profiles.
- A rollback fails if you try to modify a record that is programmed in the hardware during a rollback.
- The limitations of the Ingress NetFlow feature are as follows:
  - NetFlow for MPLS datapath is not supported

- NetFlow for VXLAN traffic is supported including OIF (output interface). The feature `nv overlay` command must be enabled on the VXLAN transit node to capture inner flow details. If not, NetFlow captures only the outer header information.
- OIF on VXLAN Encapsulation node is shown as 0x0.
- NetFlow is not supported on loopback and switch management interfaces.
- The following guidelines and limitations are applicable to Netflow in a VXLAN environment:
  - NetFlow is supported on SVI and non-uplink L3 Interfaces of a VXLAN VTEP. This does not include the L3VNI SVI.
  - NetFlow is not supported on uplink interfaces on a VXLAN VTEP.
  - NetFlow on Multisite Border Gateways is not supported.
  - A NetFlow Collector that is reachable over the VXLAN fabric is supported.
- Beginning with Cisco NX-OS Release 9.2(1):
  - NetFlow for FEX Layer 3 ports is supported on Cisco Nexus 9300-EX and 9300-FX platform switches.
  - NetFlow CE is supported on the Cisco Nexus 9300-EX platform switches.




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**Note** All EX type platform switches, including the Cisco Nexus 9700-EX line cards, CE NetFlow only captures CE flow records for non-IPv4 and IPv6 traffic flows. Whereas for FX and FX2 type platform switches and line cards, we can capture CE flow data for IP flows as long as **mac packet-classify** is applied on the interface.

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- Beginning with Cisco NX-OS Release 9.2(2), the Cisco Nexus 9300-FX switch supports collecting the OUTPUT\_SNMP field for NetFlow Data Export (NDE). No other Cisco Nexus 9000 platform switch or Cisco Nexus line card supports collecting the OUTPUT\_SNMP field.
- Beginning with Cisco NX-OS Release 9.2(2), NetFlow is supported on Cisco Nexus 9500 platform switches with Cisco Nexus 9700-EX line cards and FM-E modules.
- Ingress NetFlow is not supported on Cisco Nexus 92348GC-X platform switch.
- For Cisco Nexus 9300-EX platform switches, a flow monitor applied on a VLAN or SVI can collect flows for both switched and routed traffic. For Cisco Nexus 9300-FX platform switches, NetFlow VLANs are supported for switched traffic only, and NetFlow SVIs are supported for routed traffic only.
- The Cisco Nexus 9300-EX platform switch supports NetFlow and SPAN on the same interface at the same time. This functionality is a viable alternative to using SPAN and sFlow.
- On Cisco Nexus 9300-EX/FX platform switches, and Cisco Nexus 9500 platform switches with EX/FX modules, SPAN, and sFlow cannot both be enabled simultaneously. If one is active, the other cannot be enabled. However, on the Cisco Nexus 9300-EX/FX/FX2 and the Cisco Nexus 9500 platform switches with EX modules, both NetFlow and SPAN can be enabled simultaneously, providing a viable alternative to using sFlow and SPAN.



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**Note** Cisco Nexus 9300-FX2 platform switches support sFlow and SPAN coexistence.

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- For Cisco Nexus 9300-EX platform switches, the same flow monitor cannot be attached to a VLAN and an SVI at the same time.
- The Cisco Nexus 9300-EX platform switches have dedicated TCAM and do not require carving.
- TCAM carving configuration of the ing-netflow region can be performed on FX line cards. EX line cards have a default ing-netflow region TCAM carving of 1024 and cannot be configured otherwise. For ports on the EX and FX line cards, the suggested maximum for the ing-netflow region is 1024.
- The ToS field is not exported for Cisco Nexus 9300-EX platform switches.
- Record match that is based on IP ToS, is not supported for IPv6 flow monitors. The ToS value is collected on the collector as 0x0 irrespective of the value the traffic holds.

This limitation is applicable for the following platform switch families:

- Cisco Nexus 9300-EX
  - Cisco Nexus 9300-FX
  - Cisco Nexus 9300-FX2
  - Cisco Nexus 9300-FX3
  - Cisco Nexus 9300-GX
  - Cisco Nexus 9500 with EX and FX line cards
- The following guideline applies to all Cisco Nexus 9500 platform switches with EX and FX line cards: Configuring an EX port as a trunk when FX ports are trunks with NetFlow configurations already applied, does not remove the unsupported EX NetFlow configuration from the FX port trunks. For example, if you apply more than two different IPv4 flow monitors to FX port trunks and if EX ports are added to the same trunks, the configuration on the trunks beyond the two monitors is not automatically removed, since it's only an EX port limitation. Since this configuration will not report flows beyond two monitors for EX trunk ports, we recommend that you use only two monitors per protocol (v4/v6/CE) on modular switches that could potentially have both EX and FX ports in the same trunk.
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  - Commands **record netflow ipv4 original-input**, **record netflow ipv4 original-output**, and **record netflow layer2-switched input** are not supported in Cisco NX-OS Release 9.3(1).
  - Beginning with Cisco NX-OS Release 9.3(3), the following Non-Disruptive In-Service Software Upgrade (ND ISSU) limitations about NetFlow apply for all Cisco Nexus 9000 Series switches:
    - While performing an ND ISSU, a two-minute export loss is expected.
    - During an ND ISSU, an exporter with a management interface source port is not supported. Export loss is expected until the management interface comes up.
  - Beginning with Cisco NX-OS Release 9.3(3), ingress NetFlow is supported on Cisco Nexus 9300-GX platform switch.

- Beginning with Cisco NX-OS Release 9.3(4), the following RTP/NetFlow monitoring limitation exists:

The RTP monitoring feature enables a monitor of RTP flows on all interfaces of a switch and reports them in the **show flow rtp detail** command output. An RTP flow is any UDP flow with a source port within the range of 16384-32767. If a NetFlow monitor is attached to a switch interface with RTP monitoring enabled, then all the traffic/flows (including the RTP flows) on that interface are reported in the output of the **show flow cache** command. The RTP flows will no longer be shown in the output of the **show flow rtp detail** command. When the attached monitor is removed, the RTP flows are reported again in the **show flow rtp detail** command output.

This limitation impacts the following switches:

- Cisco Nexus 9336C-FX2
  - Cisco Nexus 93240YC-FX2
  - Cisco Nexus 9348GC-FXP
  - Cisco Nexus 93180YC-FX
  - Cisco Nexus 93108TC-FX
  - Cisco Nexus 9316D-GX
  - Cisco Nexus 93600CD-GX
  - Cisco Nexus 9364C-GX
  - Cisco Nexus 9504, 9508, and 9516 with the 9736C-FX line card
- Cisco Nexus 9500 platform switches with FM-E, FM-E2, and FM-E3 modules and Cisco Nexus 9300-FX/FX3 switches support the NetFlow output interface feature. However, output interface is not supported on 9300-EX and 9500-EX platform switches.
  - Ingress NetFlow is supported on Cisco Nexus 9500 platform switches with EX, FX, and GX mixed chassis. You can use SPAN simultaneously with NetFlow on the Cisco Nexus 9500 platform switches with EX, FX, and GX mixed chassis. Cisco Nexus 9500-GX platform switches does not support SPAN with sFlow feature mix.
  - The Cisco Nexus 3232C and 3264Q switches do not support NetFlow.
  - Beginning with Cisco NX-OS Release 10.1(2), Netflow is supported on N9K-X9716D-GX line card.
  - Enable NetFlow only on platforms that support this feature.
  - The **match ip tos** command is present in flow record configuration options, but the functionality is not supported.
  - Beginning with Cisco NX-OS Release 10.2(1)F, Layer 3 NetFlow on Layer 2 interfaces is supported on Cisco Nexus 9300-EX, 9300-FX, 9300-FX2, 9300-FX3, 9300-GX, and 9300-GX2 platform switches, and on 9500-EX LC and 9500-FX LC. Few guidelines and limitations are as follows:
    - You can attach either Layer 3 flow monitor or Layer 2 flow monitor to Layer 2 interface, not both.
    - If a flow monitor is already attached to Layer 3 interface, then the same flow monitor cannot be attached to Layer 2 interface.
    - The **mac-packet-classify** command is not supported, when Layer 3 flow monitor is applied on Layer 2 interface.

- Beginning with Cisco NX-OS Release 10.3(3)F, Netflow Output\_if\_id is supported on Cisco Nexus 9300-FX2, 9300-GX, and 9300-GX2 switches and 9500-GX Line Cards.
  - If output\_if\_id is shown as 0x0, it means that the destination IP is not resolved or not available in the routing table or the ARP table.
  - The output\_if\_id is shown as 0x0 for control packets received on ingress interface (such as BGP/PIM/OSPF/Ping packets received).
  - For IPv6 flows on Cisco Nexus 9500 Line Cards, output\_if\_id is shown as Unsupported due to hardware limitations.
- Beginning with Cisco NX-OS Release 10.4(1)F, Ingress NetFlow is supported on N9K-C9332D-H2R switch. The following limitation is applicable:
  - Drop flows is not supported by default. To enable drop flows, configure the **hardware flow-table collect-drop-reason** command.
- Beginning with Cisco NX-OS Release 10.4(2)F, the Ingress NetFlow for MPLS packet feature is supported on Cisco Nexus 9300-FX, 9300-FX2, 9300-FX3, 9300-GX, 9300-GX2, and 9500-FX/GX switches. This feature allows the Nexus switches to capture IPv4 or IPv6 flow information from MPLS packets and send the flow information to the collector. NetFlow captures information for packets with up to 8 MPLS stacked labels and supports capturing of MPLS packets such as IPoMPLS and EoMPLS packets and MPLS-VPN packets with two labels. The show flow cache shows output interface on MPLS-VPN encapsulation node as 0x0. The NetFlow output interface supports MPLS-VPN on transit or P nodes. This feature has the following limitations:
  - Due to the hardware ASIC limitations, NetFlow cannot capture MPLS related parameters such as MPLS label.
  - On transit or P nodes, MPLS VPNs with overlapping IP addresses with the same Layer 2 source and destination ports are reported as a single flow in the MPLS-VPN network.
- Beginning with Cisco NX-OS Release 10.4(2)F, Ingress NetFlow is supported on N9K-C93400LD-H1 switch. The following limitation is applicable:
  - Drop flows is not supported by default. To enable drop flows, configure the hardware flow-table collect-drop-reason command.
- Beginning with Cisco NX-OS Release 10.4(3)F, Ingress NetFlow is supported on Cisco Nexus 9364C-H1 switch.



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**Note** For verified NetFlow scalability numbers, see the [Cisco Nexus 9000 Series NX-OS Verified Scalability Guide](#).

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## Configuring Ingress NetFlow

Follow these steps to configure NetFlow:

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- Step 1** Enable the Ingress NetFlow feature.
  - Step 2** Define a flow record by specifying keys and fields to the flow.

- Step 3** Define an optional flow exporter by specifying the export format, protocol, destination, and other parameters.
- Step 4** Define a flow monitor based on the flow record and flow exporter.
- Step 5** Apply the flow monitor to a source interface, subinterface, or VLAN interface.

### Enabling the Ingress NetFlow Feature

You must globally enable NetFlow before you can configure any flows.

#### Procedure

|               | Command or Action  | Purpose   |
|---------------|--|---|
| <b>Step 1</b> | <b>configure terminal</b><br><br><b>Example:</b><br><pre>switch# configure terminal switch(config)#</pre>                                    | Enters global configuration mode.   |
| <b>Step 2</b> | <b>[no] feature netflow</b><br><br><b>Example:</b><br><pre>switch(config)# feature netflow</pre>   | Enables or disables the NetFlow feature. The default is disabled.<br><br><b>Note</b> The Cisco Nexus 9500 platform switches with N9K-T2 EoR do not support NetFlow. |
| <b>Step 3</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br><pre>switch(config)# copy running-config startup-config</pre> | Copies the running configuration to the startup configuration.  |

### Creating a Flow Record

You can create a flow record and add keys to match on and nonkey fields to collect in the flow.

#### Procedure

|               | Command or Action  | Purpose   |
|---------------|--|---|
| <b>Step 1</b> | <b>configure terminal</b><br><br><b>Example:</b><br><pre>switch# configure terminal switch(config)#</pre>                  | Enters global configuration mode.   |
| <b>Step 2</b> | <b>flow record name</b><br><br><b>Example:</b><br><pre>switch(config)# flow record Test switch(config-flow-record)#</pre>  | Creates a flow record and enters flow record configuration mode. You can enter up to 63 alphanumeric characters for the flow record name. |
| <b>Step 3</b> | (Optional) <b>description string</b><br><br><b>Example:</b><br><pre>switch(config-flow-record)# description IPv4Flow</pre> | Describes this flow record as a maximum 63-character string.  |

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 4</b> | (Optional) <b>match</b> <i>type</i><br><br><b>Example:</b><br>switch(config-flow-record)# match transport destination-port  | Specifies a match key. For more information, see <a href="#">Specifying the Match Parameters, on page 10</a> .<br><br><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data. |
| <b>Step 5</b> | (Optional) <b>collect</b> <i>type</i><br><br><b>Example:</b><br>switch(config-flow-record)# collect counter packets   | Specifies the collection field. For more information, see <a href="#">Specifying the Collect Parameters, on page 11</a> .   |
| <b>Step 6</b> | (Optional) <b>show flow record</b> [ <i>name</i> ] [ <i>record-name</i> ]<br>{ <b>netflow-original</b>   <b>netflow protocol-port</b>   <b>netflow</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>original-input</b>   <b>original-output</b> }}<br><br><b>Example:</b><br>switch(config-flow-record)# show flow record netflow protocol-port | Displays information about NetFlow flow records. You can enter up to 63 alphanumeric characters for the flow record name.   |
| <b>Step 7</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br>switch(config-flow-record)# copy running-config startup-config   | Copies the running configuration to the startup configuration.  |

### Specifying the Match Parameters

You must configure at least one of the following match parameters for flow records:

| Command  | Purpose   |
|--|---|
| <b>match datalink</b> { <b>mac source-address</b>   <b>mac destination-address</b>   <b>ethertype</b>   <b>vlan</b> }<br><br><b>Example:</b><br>switch(config-flow-record)# match datalink ethertype | Specifies the Layer 2 attribute as a key.   |
| <b>match ip</b> { <b>protocol</b>   <b>tos</b> }<br><br><b>Example:</b><br>switch(config-flow-record)# match ip protocol   | Specifies the IP protocol or ToS fields as keys.<br><br><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data.<br><br>The data is collected and displayed in the output of the <b>show hardware flow ip</b> command but is not collected and exported until you configure both commands. |

| Command  | Purpose   |
|--|---|
| <b>match ipv4</b> {destination address   source address}<br><b>Example:</b><br><pre>switch(config-flow-record)# match ipv4 destination address</pre>               | Specifies the IPv4 source or destination address as a key.  |
| <b>match ipv6</b> {destination address   source address   flow-label   options}<br><b>Example:</b><br><pre>switch(config-flow-record)# match ipv6 flow-label</pre> | Specifies the IPv6 key.   |
| <b>match transport</b> {destination-port   source-port}<br><b>Example:</b><br><pre>switch(config-flow-record)# match transport destination-port</pre>              | Specifies the transport source or destination port as a key.<br><br><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data.<br><br>The data is collected and displayed in the output of the <b>show hardware flow ip</b> command but is not collected and exported until you configure both commands. |

### Specifying the Collect Parameters

You must configure at least one of the following collect parameters for flow records:

| Command   | Purpose  |
|---|--|
| <b>collect counter</b> {bytes   packets} [long]<br><b>Example:</b><br><pre>switch(config-flow-record)# collect counter packets</pre>              | Collects either packet-based or byte counters from the flow. You can optionally specify that 64-bit counters are used. |
| <b>collect ip version</b><br><b>Example:</b><br><pre>switch(config-flow-record)# collect ip version</pre>   | Collects the IP version for the flow.  |
| <b>collect timestamp sys-uptime</b> {first   last}<br><b>Example:</b><br><pre>switch(config-flow-record)# collect timestamp sys-uptime last</pre> | Collects the system up time for the first or last packet in the flow.  |

| Command   | Purpose   |
|---|---|
| <b>collect transport tcp flags</b><br><br><b>Example:</b><br><pre>switch(config-flow-record)# collect transport tcp flags</pre> | Collects the TCP transport layer flags for the packets in the flow. |

## Creating a Flow Exporter

The flow exporter configuration defines the export parameters for a flow and specifies reachability information for the remote NetFlow Collector.

### Procedure

|               | Command or Action  | Purpose  |
|---------------|--|--|
| <b>Step 1</b> | <b>configure terminal</b><br><br><b>Example:</b><br><pre>switch# configure terminal switch(config)#</pre>  | Enters global configuration mode.  |
| <b>Step 2</b> | <b>flow exporter name</b><br><br><b>Example:</b><br><pre>switch(config)# flow exporter flow-exporter-one switch(config-flow-exporter)#</pre>             | Creates a flow exporter and enters flow exporter configuration mode. You can enter up to 63 alphanumeric characters for the flow exporter name.  |
| <b>Step 3</b> | <b>destination {ipv4-address   ipv6-address} [use-vrf name]</b><br><br><b>Example:</b><br><pre>switch(config-flow-exporter)# destination 192.0.2.1</pre> | Sets the destination IPv4 or IPv6 address for this flow exporter. You can optionally configure the VRF to use to reach the NetFlow Collector. You can enter up to 32 alphanumeric characters for the VRF name. |
| <b>Step 4</b> | <b>source interface-type name/port</b><br><br><b>Example:</b><br><pre>switch(config-flow-exporter)# source ethernet 2/1</pre>                            | Specifies the interface to use to reach the NetFlow Collector at the configured destination.   |
| <b>Step 5</b> | (Optional) <b>description string</b><br><br><b>Example:</b><br><pre>switch(config-flow-exporter)# description exportversion9</pre>                       | Describes this flow exporter. You can enter up to 63 alphanumeric characters for the description.  |
| <b>Step 6</b> | (Optional) <b>dscp value</b><br><br><b>Example:</b><br><pre>switch(config-flow-exporter)# dscp 0</pre>   | Specifies the differentiated services codepoint value. The range is from 0 to 63.  |
| <b>Step 7</b> | (Optional) <b>transport udp port</b><br><br><b>Example:</b><br><pre>switch(config-flow-exporter)# transport udp 200</pre>                                | Specifies the UDP port to use to reach the NetFlow Collector. The range is from 0 to 65535.<br><br><b>Note</b> If you do not specify the UDP port, 9995 is selected as the default.                            |

|                | Command or Action   | Purpose  |
|----------------|---|--|
| <b>Step 8</b>  | <b>version 9</b><br><b>Example:</b><br><pre>switch(config-flow-exporter)# version 9 switch(config-flow-exporter-version-9)#</pre>   | Specifies the NetFlow export version. Choose version 9 to enter the flow exporter version 9 configuration submenu. |
| <b>Step 9</b>  | (Optional) <b>option {exporter-stats   interface-table} timeout seconds</b><br><b>Example:</b><br><pre>switch(config-flow-exporter-version-9)# option exporter-stats timeout 1200</pre> | Sets the flow exporter statistics resend timer. The range is from 1 to 86400 seconds.                              |
| <b>Step 10</b> | (Optional) <b>template data timeout seconds</b><br><b>Example:</b><br><pre>switch(config-flow-exporter-version-9)# template data timeout 1200</pre>                                     | Sets the template data resend timer. The range is from 1 to 86400 seconds.   |
| <b>Step 11</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br><pre>switch(config-flow-exporter-version-9)# copy running-config startup-config</pre>                        | Copies the running configuration to the startup configuration.   |

### Creating a Flow Monitor

You can create a flow monitor and associate it with a flow record and a flow exporter. All of the flows that belong to a monitor use the associated flow record to match on the different fields, and the data is exported to the specified flow exporter.

#### Procedure

|               | Command or Action  | Purpose  |
|---------------|--|--|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br><pre>switch# configure terminal switch(config)#</pre>                                | Enters global configuration mode.  |
| <b>Step 2</b> | <b>flow monitor name</b><br><b>Example:</b><br><pre>switch(config)# flow monitor flow-monitor-one switch(config-flow-monitor)#</pre> | Creates a flow monitor and enters flow monitor configuration mode. You can enter up to 63 alphanumeric characters for the flow monitor name. |
| <b>Step 3</b> | (Optional) <b>description string</b><br><b>Example:</b><br><pre>switch(config-flow-monitor)# description IPv4Monitor</pre>           | Describes this flow monitor. You can enter up to 63 alphanumeric characters for the description.   |

## Applying a Flow Monitor to an Interface

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 4</b> | (Optional) <b>exporter name</b><br><br><b>Example:</b><br>switch(config-flow-monitor)# export v9  | Associates a flow exporter with this flow monitor. You can enter up to 63 alphanumeric characters for the exporter name.   |
| <b>Step 5</b> | <b>record name [netflow-original   netflow protocol-port   netflow {ipv4   ipv6} {original-input   original-output}]</b><br><br><b>Example:</b><br>switch(config-flow-monitor)# record IPv4Flow | Associates a flow record with the specified flow monitor. You can enter up to 63 alphanumeric characters for the record name.<br><br><b>Note</b> <b>record netflow ipv4 original-input, record netflow ipv4 original-output, and record netflow layer2-switched input</b> are not supported in Cisco NX-OS Release 9.3(1). |
| <b>Step 6</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br>switch(config-flow-monitor)# copy running-config startup-config  | Copies the running configuration to the startup configuration.   |

## Applying a Flow Monitor to an Interface

You can apply a flow monitor to an ingress interface.

## Procedure

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 1</b> | <b>configure terminal</b><br><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#                                     | Enters global configuration mode.  |
| <b>Step 2</b> | <b>interface vlan vlan-id</b><br><br><b>Example:</b><br>switch(config)# interface vlan 10<br>switch(config-if)#                       | Configures a VLAN interface and enters interface configuration mode.                           |
| <b>Step 3</b> | <b>ip flow monitor {ipv4   ipv6   layer-2-switched} input</b><br><br><b>Example:</b><br>switch(config-if)# ip flow monitor ipv4 input | Associates an IPv4, IPv6, or Layer 2-switched flow monitor to the interface for input packets. |
| <b>Step 4</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br>switch(config-if)# copy running-config startup-config  | Copies the running configuration to the startup configuration.                                 |

## Configuring Bridged NetFlow on a VLAN

You can apply a flow monitor to a VLAN in order to gather Layer 3 data over Layer 2 switched packets in a VLAN.

### Procedure

|               | Command or Action  | Purpose  |
|---------------|--|--|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br><pre>switch# configure terminal switch(config)#</pre>  | Enters global configuration mode.  |
| <b>Step 2</b> | <b>vlan configuration <i>vlan-id</i></b><br><b>Example:</b><br><pre>switch(config)# vlan configuration 30 switch(config-vlan-config)#</pre>          | Enters VLAN configuration mode. The VLAN ID range is from 1 to 3967 or from 4048 to 4093.<br><br><b>Note</b> VLAN configuration mode enables you to configure VLANs independently of their creation, which is required for VTP client support. |
| <b>Step 3</b> | <b>{ip   ipv6} flow monitor <i>name</i></b><br><b>Example:</b><br><pre>switch(config-vlan-config)# ip flow monitor testmonitor</pre>                 | Associates a flow monitor to the VLAN for input packets. You can enter up to 63 alphanumeric characters for the flow monitor name.   |
| <b>Step 4</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br><pre>switch(config-vlan-config)# copy running-config startup-config</pre> | Copies the running configuration to the startup configuration.   |

## Configuring Layer 2 NetFlow Keys

You can define Layer 2 keys in flexible NetFlow records that you can use to capture flows in Layer 2 interfaces.

### Procedure

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br><pre>switch# configure terminal switch(config)#</pre>                             | Enters global configuration mode.   |
| <b>Step 2</b> | <b>flow record <i>name</i></b><br><b>Example:</b><br><pre>switch(config)# flow record L2_record switch(config-flow-record)#</pre> | Enters flow record configuration mode. For more information about configuring flow records, see <a href="#">Creating a Flow Record, on page 9</a> . |

|                | Command or Action   | Purpose  |
|----------------|---|--|
| <b>Step 3</b>  | <b>match datalink</b> { <b>mac source-address</b>   <b>mac destination-address</b>   <b>ethertype</b>   <b>vlan</b> }<br><b>Example:</b><br><pre>switch(config-flow-record)# match datalink ethertype</pre> | Specifies the Layer 2 attribute as a key.  |
| <b>Step 4</b>  | <b>exit</b><br><b>Example:</b><br><pre>switch(config-flow-record)# exit switch(config)#</pre>   | Exits flow record configuration mode.  |
| <b>Step 5</b>  | <b>interface</b> { <b>ethernet slot/port</b>   <b>port-channel number</b> }<br><b>Example:</b><br><pre>switch(config)# interface Ethernet 6/3 switch(config-if#)</pre>                                      | Enters interface configuration mode. The interface type can be a physical Ethernet port or a port channel.   |
| <b>Step 6</b>  | <b>switchport</b><br><b>Example:</b><br><pre>switch(config-if)# switchport</pre>  | Changes the interface to a Layer 2 physical interface. For information on configuring switch ports, see the <a href="#">Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide</a> .  |
| <b>Step 7</b>  | <b>mac packet-classify</b><br><b>Example:</b><br><pre>switch(config-if)# mac packet-classify</pre>  | <p>Forces MAC classification of packets.</p> <p>For more information on using this command, see the <a href="#">Cisco Nexus 9000 Series NX-OS Security Configuration Guide</a>.</p> <p><b>Note</b> You must use this command to capture flows.</p> |
| <b>Step 8</b>  | <b>layer2-switched flow monitor</b> <i>flow-name</i> <b>input</b><br><b>Example:</b><br><pre>switch(config-if)# layer2-switched flow monitor L2_monitor input</pre>   | Associates a flow monitor to the switch port input packets. You can enter up to 63 alphanumeric characters for the flow monitor name.  |
| <b>Step 9</b>  | (Optional) <b>show flow record netflow layer2-switched input</b><br><b>Example:</b><br><pre>switch(config-if)# show flow record netflow layer2-switched input</pre>   | Displays information about the Layer 2 NetFlow default record.   |
| <b>Step 10</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br><pre>switch(config-if)# copy running-config startup-config</pre>   | Copies the running configuration to the startup configuration.   |

### Configuring Layer 3 NetFlow on Layer 2 Interfaces

You can define Layer 3 flow monitors on Layer 2 interfaces to capture Layer 3 flow information on Layer 2 interfaces.

## Procedure

|               | Command or Action  | Purpose   |
|---------------|--|---|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#  | Enters global configuration mode.   |
| <b>Step 2</b> | <b>flow record <i>name</i></b><br><b>Example:</b><br>switch(config)# flow record L3_record<br>switch(config-flow-record)#                                    | Enters flow record configuration mode. For more information about configuring flow records, see <a href="#">Creating a Flow Record, on page 9</a> .                                 |
| <b>Step 3</b> | <b>interface {<i>ethernet slot/port</i>   <i>port-channel number</i>}</b><br><b>Example:</b><br>switch(config)# interface Ethernet 6/3<br>switch(config-if#) | Enters interface configuration mode. The interface type can be a physical Ethernet port or a port channel.  |
| <b>Step 4</b> | <b>switchport</b><br><b>Example:</b><br>switch(config-if)# switchport  | Changes the interface to a Layer 2 mode. For information on configuring switch ports, see the <a href="#">Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide</a> . |
| <b>Step 5</b> | <b>ip flow monitor <i>flow-name</i> input</b><br><b>Example:</b><br>switch(config-if)# ip flow monitor v41 input   | Associates an IPv4 flow monitor to the switch port input packets. You can enter up to 63 alphanumeric characters for the flow monitor name.   |
| <b>Step 6</b> | <b>ipv6 flow monitor <i>flow-name</i> input</b><br><b>Example:</b><br>switch(config-if)# ipv6 flow monitor v61 input   | Associates an IPv6 flow monitor to the switch port input packets. You can enter up to 63 alphanumeric characters for the flow monitor name.   |
| <b>Step 7</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br>switch(config-if)# copy running-config startup-config                             | Copies the running configuration to the startup configuration.  |

## Configuring NetFlow Timeouts

You can optionally configure global NetFlow timeouts that apply to all flows in the system.

## Procedure

|               | Command or Action   | Purpose                           |
|---------------|---|-----------------------------------|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)# | Enters global configuration mode. |

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 2</b> | <b>flow timeout</b> <i>seconds</i><br><br><b>Example:</b><br>switch(config)# flow timeout 30                                      | Sets the flush timeout value in seconds. The range is from 5 to 60 seconds. The default value is 10 seconds. |
| <b>Step 3</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br>switch(config)# copy running-config startup-config | Copies the running configuration to the startup configuration.   |

## Verifying the Ingress NetFlow Configuration

To display the Ingress NetFlow configuration, perform one of the following tasks:

| Command  | Purpose  |
|--|--|
| <b>show flow cache</b> [ <i>ipv4</i>   <i>ipv6</i>   <i>ce</i> ] | Displays information about Ingress NetFlow IP flows.   |
| <b>show flow exporter</b> [ <i>name</i> ]                        | Displays information about Ingress NetFlow flow exporters and statistics. You can enter up to 63 alphanumeric characters for the flow exporter name. |
| <b>show flow interface</b> [ <i>interface-type slot/port</i> ]   | Displays information about Ingress NetFlow interfaces.   |
| <b>show flow record</b> [ <i>name</i> ]                          | Displays information about Ingress NetFlow flow records. You can enter up to 63 alphanumeric characters for the flow record name.                    |
| <b>show flow record netflow layer2-switched input</b>            | Displays information about the Layer 2 Ingress NetFlow configuration.  |
| <b>show running-config netflow</b>                               | Displays the NetFlow configuration that is currently on your device.   |

## Monitoring Ingress NetFlow

Use the **show flow exporter** command to display NetFlow statistics. Use the **clear flow exporter** command to clear NetFlow flow exporter statistics.

## Display Example for Ingress NetFlow

The output of the **show flow cache** command for IPv4 displays:

```
show flow cache
IPV4 Entries
SIP      DIP      BD ID  S-Port  D-Port  Protocol  Byte Count  Packet Count  TCP FLAGS
TOS  if_id  output_if_id  flowStart flowEnd
10.10.30.4  30.33.1.2  1480  30000  17998  17      683751850  471553      0x0
      0x0  0x90105c8  0x1a005000  14096494  14153835
30.33.1.2  10.10.39.4  4145  30000  18998  17      43858456  30164      0x0
      0x0  0x1a005000  0x1a006600  14096477  14099491
10.10.29.4  30.33.1.2  1479  30000  17998  17      683751850  471553      0x0
```

```

0x0 0x90105c7 0x1a005000 14096476 14153817
10.10.7.4 30.33.1.2 1457 30000 17998 17 683753300 471554 0x0
0x0 0x90105b1 0x1a005000 14096481 14153822
30.33.1.2 10.10.42.4 4145 30000 18998 17 95289344 65536 0x0
0x0 0x1a005000 0x1a006600 14112551 14119151
10.10.49.4 30.33.1.2 1499 30000 17998 17 683753300 471554 0x0
0x0 0x90105db 0x1a005000 14096486 14153827

```

## Configuration Example for Ingress NetFlow

This example shows how to configure an Ingress NetFlow exporter configuration for IPv4:

```

feature netflow
flow exporter ee
 destination 171.70.242.48 use-vrf management
 source mgmt0
 version 9
 template data timeout 20
flow record rr
 match ipv4 source address
 match ipv4 destination address
 collect counter bytes
 collect counter packets
flow monitor foo
 record rr
 exporter ee
interface Ethernet2/45
 ip flow monitor foo input
 ip address 10.20.1.1/24
 no shutdown

```

## Configuring Egress NetFlow

### About Egress NetFlow

Egress NetFlow identifies packet flows for outgoing IP packets and Layer2 flows and provides statistics based on these packet flows. On Cisco Nexus Cloudscale 9000 switches, egress NetFlow uses ingress pipeline and ingress TCAM carving egr-netflow to record flow information egressing out of the switch. All parameters of regular NetFlow (ingress NetFlow) such as flow records, flow exporters, and flow monitors are applicable to egress NetFlow. Similarly, most of the restrictions of ingress NetFlow are applicable to egress NetFlow. For more details, see [About Ingress NetFlow, on page 1](#).

### Prerequisites for Egress NetFlow

Egress NetFlow has the following prerequisites:

1. Configure the Nexus 9000 switches with egress NetFlow TCAM region.
2. Reload the switch after egress NetFlow TCAM carving.
3. When the switch comes online, enable the egress NetFlow on any L2 or L3 interface under interfaces using the **ip flow monitor <> output or layer2-switched flow monitor <> output** command.

## Guidelines and Limitations for Egress NetFlow



**Note** For verified NetFlow scalability numbers, see the release-specific *Cisco Nexus 9000 Series NX-OS Verified Scalability Guide* on [Cisco.com](https://www.cisco.com).

Egress NetFlow has the following configuration guidelines and limitations:

- If both ingress and egress NetFlow are enabled on an interface, ingress NetFlow is prioritized over egress NetFlow and flow information is generated in ingress direction.
- For ingress NetFlow, flows are identified with Ingress(0) field in CFLOW packet.
- For egress NetFlow, flows are identified with Egress(1) field in CFLOW packet.
- Egress NetFlow and feature analytics can coexist, but the traffic flows that hit analytics filters are only exported to collectors configured under analytics.
- On modular Cisco Nexus 9500 chassis, traffic comes in and goes out on different line cards. If egress NetFlow is enabled on traffic outgoing interface and not enabled on traffic incoming interface, the egress flow information is captured on ingress interface line card and not captured on egress interface.
- If there are more than one SVI and sub\_interface on L2 interface, the ingress interface (if\_id) derivation need not be correct for egress NetFlow.
- Egress NetFlow is not supported on Cisco Nexus 9300-EX, Nexus 9500 modular switches with EX Line cards, N9K-C9364C, and N9K-C9332C switches.
- Egress NetFlow is supported only for IPv4 and Layer 2 traffic. Egress NetFlow does not support IPv6 and multicast traffic.
- Egress NetFlow does not support the following:
  - vrf-id
  - Recording of outgoing control plane traffic
  - Output Interface (NetFlow OIF)
  - MPLS network

## Configuring Egress NetFlow

Follow these steps to configure egress NetFlow:

- Step 1** Enable the NetFlow feature.
- Step 2** Perform egr-netflow TCAM carving and reload the switch.
- Step 3** Define a flow record by specifying keys and fields to the flow.
- Step 4** Define a flow exporter by specifying the export format, protocol, destination, and other parameters.
- Step 5** Define a flow monitor based on the flow record and flow exporter.
- Step 6** Apply the flow monitor to a source interface, subinterface, or VLAN interface.

## Enabling the Egress NetFlow Feature

You must globally enable egress NetFlow before you can configure any flows.

### Procedure

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#                                 | Enters global configuration mode.   |
| <b>Step 2</b> | <b>[no] feature netflow</b><br><b>Example:</b><br>switch(config)# feature netflow   | Enables or disables the NetFlow feature. The default is disabled.<br><b>Note</b> The Cisco Nexus 9500 platform switches with N9K-T2 EoR do not support NetFlow. |
| <b>Step 3</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br>switch(config)# copy running-config startup-config | Copies the running configuration to the startup configuration.  |

## Creating a Flow Record

You can create a flow record and add keys to match on and nonkey fields to collect in the flow.

### Procedure

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#                   | Enters global configuration mode.   |
| <b>Step 2</b> | <b>flow record name</b><br><b>Example:</b><br>switch(config)# flow record Test<br>switch(config-flow-record)#   | Creates a flow record and enters flow record configuration mode. You can enter up to 63 alphanumeric characters for the flow record name.   |
| <b>Step 3</b> | (Optional) <b>description string</b><br><b>Example:</b><br>switch(config-flow-record)# description IPv4Flow     | Describes this flow record as a maximum 63-character string.  |
| <b>Step 4</b> | (Optional) <b>match type</b><br><b>Example:</b><br>switch(config-flow-record)# match transport destination-port | Specifies a match key. For more information, see <a href="#">Specifying the Match Parameters, on page 23</a> .<br><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data. |

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 5</b> | (Optional) <code>collect type</code><br><b>Example:</b><br><code>switch(config-flow-record)# collect counter packets</code>   | Specifies the collection field. For more information, see <a href="#">Specifying the Collect Parameters, on page 24</a> . |
| <b>Step 6</b> | (Optional) <code>show flow record [name] [record-name]</code><br><code>{netflow-original   netflow protocol-port   netflow {ipv4   ipv6} {original-input   original-output}}</code><br><b>Example:</b><br><code>switch(config-flow-record)# show flow record netflow protocol-port</code> | Displays information about NetFlow flow records. You can enter up to 63 alphanumeric characters for the flow record name. |
| <b>Step 7</b> | (Optional) <code>copy running-config startup-config</code><br><b>Example:</b><br><code>switch(config-flow-record)# copy running-config startup-config</code>  | Copies the running configuration to the startup configuration.  |

## Performing Egress NetFlow TCAM Carving

You must perform egress NetFlow TCAM carving, save the configuration, and reload the switch.

### Procedure

|               | Command or Action  | Purpose  |
|---------------|--|--|
| <b>Step 1</b> | <code>configure terminal</code><br><b>Example:</b><br><code>switch# configure terminal</code><br><code>switch(config)#</code>  | Enters global configuration mode.  |
| <b>Step 2</b> | <code>[no] hardware access-list tcam region egr-netflow {0   512}</code><br><b>Example:</b><br><code>switch(config)# hardware access-list tcam region egr-netflow 512</code> | Enables egress NetFlow TCAM carving, and the default is disabled. The supported values are 0 and 512 for egr-netflow TCAM carving. |
| <b>Step 3</b> | <code>copy running-config startup-config</code><br><b>Example:</b><br><code>switch(config)# copy running-config startup-config</code>  | Copies the running configuration to the startup configuration.   |
| <b>Step 4</b> | <code>reload</code><br><b>Example:</b><br><code>switch(config)# reload</code><br>This command will reboot the system. (y/n)? [n] <b>y</b>                                    | Reloads the switch.  |

## Creating a Flow Record

You can create a flow record and add keys to match on and nonkey fields to collect in the flow.

## Procedure

|               | Command or Action  | Purpose   |
|---------------|--|---|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#  | Enters global configuration mode.   |
| <b>Step 2</b> | <b>flow record name</b><br><b>Example:</b><br>switch(config)# flow record Test<br>switch(config-flow-record)#  | Creates a flow record and enters flow record configuration mode. You can enter up to 63 alphanumeric characters for the flow record name.   |
| <b>Step 3</b> | (Optional) <b>description string</b><br><b>Example:</b><br>switch(config-flow-record)# description IPv4Flow  | Describes this flow record as a maximum 63-character string.  |
| <b>Step 4</b> | (Optional) <b>match type</b><br><b>Example:</b><br>switch(config-flow-record)# match transport destination-port  | Specifies a match key. For more information, see <a href="#">Specifying the Match Parameters, on page 23</a> .<br><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data. |
| <b>Step 5</b> | (Optional) <b>collect type</b><br><b>Example:</b><br>switch(config-flow-record)# collect counter packets   | Specifies the collection field. For more information, see <a href="#">Specifying the Collect Parameters, on page 24</a> .   |
| <b>Step 6</b> | (Optional) <b>show flow record [name] [record-name] {netflow-original   netflow protocol-port   netflow {ipv4   ipv6} {original-input   original-output}}</b><br><b>Example:</b><br>switch(config-flow-record)# show flow record netflow protocol-port | Displays information about NetFlow flow records. You can enter up to 63 alphanumeric characters for the flow record name.   |
| <b>Step 7</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br>switch(config-flow-record)# copy running-config startup-config  | Copies the running configuration to the startup configuration.  |

## Specifying the Match Parameters

You must configure at least one of the following match parameters for flow records:

| Command   | Purpose  |
|---|--|
| <p><b>match datalink</b> {mac source-address   mac destination-address   ethertype   vlan}</p> <p><b>Example:</b></p> <pre>switch(config-flow-record)# match datalink ethertype</pre> | Specifies the Layer 2 attribute as a key.  |
| <p><b>match ip</b> {protocol   tos}</p> <p><b>Example:</b></p> <pre>switch(config-flow-record)# match ip protocol</pre>   | <p>Specifies the IP protocol or ToS fields as keys.</p> <p><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data.</p> <p>The data is collected and displayed in the output of the <b>show hardware flow ip</b> command but is not collected and exported until you configure both commands.</p>             |
| <p><b>match ipv4</b> {destination address   source address}</p> <p><b>Example:</b></p> <pre>switch(config-flow-record)# match ipv4 destination address</pre>                          | Specifies the IPv4 source or destination address as a key.   |
| <p><b>match ipv6</b> {destination address   source address   flow-label   options}</p> <p><b>Example:</b></p> <pre>switch(config-flow-record)# match ipv6 flow-label</pre>            | Specifies the IPv6 key.  |
| <p><b>match transport</b> {destination-port   source-port}</p> <p><b>Example:</b></p> <pre>switch(config-flow-record)# match transport destination-port</pre>                         | <p>Specifies the transport source or destination port as a key.</p> <p><b>Note</b> The <b>match transport destination-port</b> and <b>match ip protocol</b> commands are required to export Layer 4 port data.</p> <p>The data is collected and displayed in the output of the <b>show hardware flow ip</b> command but is not collected and exported until you configure both commands.</p> |

### Specifying the Collect Parameters

You must configure at least one of the following collect parameters for flow records:

| Command  | Purpose  |
|--|--|
| <b>collect counter</b> {bytes   packets} [long]<br><b>Example:</b><br>switch(config-flow-record)# collect counter packets              | Collects either packet-based or byte counters from the flow. You can optionally specify that 64-bit counters are used. |
| <b>collect ip version</b><br><b>Example:</b><br>switch(config-flow-record)# collect ip version   | Collects the IP version for the flow.  |
| <b>collect timestamp sys-uptime</b> {first   last}<br><b>Example:</b><br>switch(config-flow-record)# collect timestamp sys-uptime last | Collects the system up time for the first or last packet in the flow.  |
| <b>collect transport tcp flags</b><br><b>Example:</b><br>switch(config-flow-record)# collect transport tcp flags                       | Collects the TCP transport layer flags for the packets in the flow.  |

### Creating a Flow Exporter

The flow exporter configuration defines the export parameters for a flow and specifies reachability information for the remote Egress NetFlow Collector.

#### Procedure

|               | Command or Action   | Purpose   |
|---------------|---|---|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#   | Enters global configuration mode.   |
| <b>Step 2</b> | <b>flow exporter name</b><br><b>Example:</b><br>switch(config)# flow exporter flow-exporter-one<br>switch(config-flow-exporter)#          | Creates a flow exporter and enters flow exporter configuration mode. You can enter up to 63 alphanumeric characters for the flow exporter name.   |
| <b>Step 3</b> | <b>destination</b> {ipv4-address   ipv6-address} [use-vrf name]<br><b>Example:</b><br>switch(config-flow-exporter)# destination 192.0.2.1 | Sets the destination IPv4 or IPv6 address for this flow exporter. You can optionally configure the VRF to use to reach the Egress NetFlow Collector. You can enter up to 32 alphanumeric characters for the VRF name. |
| <b>Step 4</b> | <b>source interface-type name/port</b><br><b>Example:</b><br>switch(config-flow-exporter)# source ethernet 2/1                            | Specifies the interface to use to reach the Egress NetFlow Collector at the configured destination.   |

|                | Command or Action  | Purpose   |
|----------------|--|---|
| <b>Step 5</b>  | (Optional) <b>description</b> <i>string</i><br><b>Example:</b><br>switch(config-flow-exporter)# description<br>exportversion9  | Describes this flow exporter. You can enter up to 63 alphanumeric characters for the description.   |
| <b>Step 6</b>  | (Optional) <b>dscp</b> <i>value</i><br><b>Example:</b><br>switch(config-flow-exporter)# dscp 0   | Specifies the differentiated services codepoint value. The range is from 0 to 63.   |
| <b>Step 7</b>  | (Optional) <b>transport udp</b> <i>port</i><br><b>Example:</b><br>switch(config-flow-exporter)# transport udp 200  | Specifies the UDP port to use to reach the NetFlow Collector. The range is from 0 to 65535.<br><b>Note</b> If you do not specify the UDP port, 9995 is selected as the default. |
| <b>Step 8</b>  | <b>version 9</b><br><b>Example:</b><br>switch(config-flow-exporter)# version 9<br>switch(config-flow-exporter-version-9)#  | Specifies the NetFlow export version. Choose version 9 to enter the flow exporter version 9 configuration submode.  |
| <b>Step 9</b>  | (Optional) <b>option</b> { <b>exporter-stats</b>   <b>interface-table</b> }<br><b>timeout</b> <i>seconds</i><br><b>Example:</b><br>switch(config-flow-exporter-version-9)# option<br>exporter-stats timeout 1200 | Sets the flow exporter statistics resend timer. The range is from 1 to 86400 seconds.   |
| <b>Step 10</b> | (Optional) <b>template data</b> <b>timeout</b> <i>seconds</i><br><b>Example:</b><br>switch(config-flow-exporter-version-9)# template<br>data timeout 1200  | Sets the template data resend timer. The range is from 1 to 86400 seconds.  |
| <b>Step 11</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br>switch(config-flow-exporter-version-9)# copy<br>running-config startup-config   | Copies the running configuration to the startup configuration.  |

## Creating a Flow Monitor

You can create a flow monitor and associate it with a flow record and a flow exporter. All of the flows that belong to a monitor use the associated flow record to match on the different fields, and the data is exported to the specified flow exporter.

### Procedure

|               | Command or Action                            | Purpose                           |
|---------------|--|-----------------------------------|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b> | Enters global configuration mode. |

|               | Command or Action  | Purpose  |
|---------------|--|--|
|               | switch# configure terminal<br>switch(config)#  |  |
| <b>Step 2</b> | <b>flow monitor</b> <i>name</i><br><b>Example:</b><br>switch(config)# flow monitor flow-monitor-one<br>switch(config-flow-monitor)#  | Creates a flow monitor and enters flow monitor configuration mode. You can enter up to 63 alphanumeric characters for the flow monitor name. |
| <b>Step 3</b> | (Optional) <b>description</b> <i>string</i><br><b>Example:</b><br>switch(config-flow-monitor)# description IPv4Monitor   | Describes this flow monitor. You can enter up to 63 alphanumeric characters for the description.   |
| <b>Step 4</b> | (Optional) <b>exporter</b> <i>name</i><br><b>Example:</b><br>switch(config-flow-monitor)# export v9  | Associates a flow exporter with this flow monitor. You can enter up to 63 alphanumeric characters for the exporter name.                     |
| <b>Step 5</b> | <b>record</b> <i>name</i> [ <b>netflow-original</b>   <b>netflow protocol-port</b>   <b>netflow</b> { <b>ipv4</b>   <b>ipv6</b> } { <b>original-input</b>   <b>original-output</b> }]<br><b>Example:</b><br>switch(config-flow-monitor)# record IPv4Flow | Associates a flow record with the specified flow monitor. You can enter up to 63 alphanumeric characters for the record name.                |
| <b>Step 6</b> | (Optional) <b>copy running-config startup-config</b><br><b>Example:</b><br>switch(config-flow-monitor)# copy running-config startup-config   | Copies the running configuration to the startup configuration.   |

### Applying a Flow Monitor to an Interface

You can apply a flow monitor in egress direction using the **output** keyword.

#### Procedure

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 1</b> | <b>configure terminal</b><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#   | Enters global configuration mode.  |
| <b>Step 2</b> | <b>interface vlan</b> <i>vlan-id</i><br><b>Example:</b><br>switch(config)# interface vlan 10<br>switch(config-if)#  | Configures a VLAN interface and enters interface configuration mode.                           |
| <b>Step 3</b> | <b>ip flow monitor</b> { <b>ipv4</b>   <b>ipv6</b>   <b>layer-2-switched</b> } <b>input</b><br><b>Example:</b><br>switch(config-if)# ip flow monitor ipv4 input | Associates an IPv4, IPv6, or Layer 2-switched flow monitor to the interface for input packets. |

|               | Command or Action  | Purpose  |
|---------------|--|--|
| <b>Step 4</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br>switch(config-if)# copy running-config startup-config | Copies the running configuration to the startup configuration. |

## Configuring Layer 3 Egress NetFlow on Layer 2 Interfaces

You can define Layer 3 flow monitors on Layer 2 interfaces to capture Layer 3 flow information on Layer 2 interfaces.

### Procedure

|               | Command or Action   | Purpose  |
|---------------|---|--|
| <b>Step 1</b> | <b>configure terminal</b><br><br><b>Example:</b><br>switch# configure terminal<br>switch(config)#   | Enters global configuration mode.  |
| <b>Step 2</b> | <b>flow record <i>name</i></b><br><br><b>Example:</b><br>switch(config)# flow record L3_record<br>switch(config-flow-record)#   | Enters flow record configuration mode. For more information about configuring flow records, see <a href="#">Creating a Flow Record, on page 21</a> .   |
| <b>Step 3</b> | <b>interface {ethernet <i>slot/port</i>   port-channel <i>number</i>}</b><br><br><b>Example:</b><br>switch(config)# interface Ethernet 6/3<br>switch(config-if#)                            | Enters interface configuration mode. The interface type can be a physical Ethernet port or a port channel.   |
| <b>Step 4</b> | <b>switchport</b><br><br><b>Example:</b><br>switch(config-if)# switchport   | Changes the interface to a Layer 2 mode. For information on configuring switch ports, see <a href="#">Cisco Nexus 9000 Series NX-OS Layer 2 Switching Configuration Guide</a> .  |
| <b>Step 5</b> | <b>ip flow monitor <i>flow-name</i> input   output</b><br><br><b>Example:</b><br>switch(config-if)# ip flow monitor v41 input<br>switch(config-if)# layer2-switched flow monitor v41 output | or<br><br><b>layer2-switched flow monitor <i>flow-name</i> input   output</b><br><br>Associates an IPv4 flow monitor to the switch port input or output packets. You can enter up to 63 alphanumeric characters for the flow monitor name. |
| <b>Step 6</b> | (Optional) <b>copy running-config startup-config</b><br><br><b>Example:</b><br>switch(config-if)# copy running-config startup-config  | Copies the running configuration to the startup configuration.   |

## Verifying the Egress NetFlow Configuration

To display the egress NetFlow configuration, perform one of the following tasks:

| Command   | Purpose   |
|---|---|
| <code>show flow cache [ipv4   ce] [output]</code> | Displays information about egress NetFlow IP flows.                         |
| <code>show running-config netflow</code>          | Displays the egress NetFlow configuration that is currently on your device. |

## Display Example for Egress NetFlow

The output of the `show flow cache` command for IPv4 displays:

```
switch(config-if-range)# show flow cache
NOTE: Only 10k flows are displayed in XML output
Egress IPV4 Entries
SIP          DIP          BD ID   S-Port   D-Port   Protocol   Byte Count
Packet Count TCP FLAGS   TOS     if_id     output_if_id  flowStart  flowEnd
Profile     Ing-VRF
130.1.1.2   162.1.1.1   4119    60       893      6          161082
171         0x0         0x0     0x1a002600 0x1a002800 716994    732532
   4 : NF    21
130.1.1.2   162.1.1.1   4151    60       11013   6          61230
65         0x0         0x0     0x1a006600 0x1a006800 715951    728074
   4 : NF    38
130.1.1.2   162.1.1.1   4145    60       3441    6          162966
173         0x0         0x0     0x1a005a00 0x1a005c00 713085    727941
   4 : NF    35
```

## Configuration Example for NetFlow

This example shows how to configure an egress NetFlow exporter configuration for IPv4:

```
feature netflow
flow exporter ee
 destination 171.70.242.48 use-vrf management
 source mgmt0
 version 9
 template data timeout 20
flow record rr
 match ipv4 source address
 match ipv4 destination address
 collect counter bytes
 collect counter packets
flow monitor foo
 record rr
 exporter ee
interface Ethernet2/45
 ip flow monitor foo output
 ip address 10.20.1.1/24
 no shutdown
```

