



Configuring NetFlow and NetFlow Data Export

This module contains information about and instructions for configuring NetFlow to capture and export network traffic data. NetFlow capture and export are performed independently on each internetworking device on which NetFlow is enabled. NetFlow need not be operational on each router in the network.

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

Module History

This module was first published on June 19th, 2006, and last updated on June 19th, 2006.

Finding Feature Information in This Module

Your Cisco IOS software release may not support all features. To find information about feature support and configuration, use the [“Feature Information for Configuring NetFlow and NetFlow Data Export”](#) section on page 37.

Contents

- [Prerequisites for Configuring NetFlow and NetFlow Data Export, page 1](#)
- [Restrictions for Configuring NetFlow and NetFlow Data Export, page 2](#)
- [Information About Configuring NetFlow and NetFlow Data Export, page 3](#)
- [How to Configure NetFlow and NetFlow Data Export, page 19](#)
- [Configuration Examples for Configuring NetFlow and NetFlow Data Export, page 31](#)
- [Additional References, page 34](#)
- [Glossary, page 36](#)
- [Feature Information for Configuring NetFlow and NetFlow Data Export, page 37](#)

Prerequisites for Configuring NetFlow and NetFlow Data Export

Before you enable NetFlow you must:



Americas Headquarters:
Cisco Systems, Inc., 170 West Tasman Drive, San Jose, CA 95134-1706 USA

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- Configure the router for IP routing
- Ensure that one of the following is enabled on your router, and on the interfaces that you want to configure NetFlow on: Cisco Express Forwarding (CEF), distributed CEF, or fast switching
- Understand the resources required on your router because NetFlow consumes additional memory and CPU resources

Restrictions for Configuring NetFlow and NetFlow Data Export

NetFlow Data Capture

NetFlow consumes additional memory. If you have memory constraints, you might want to preset the size of the NetFlow cache so that it contains a smaller number of entries. The default cache size depends on the platform. For example, the default cache size for the Cisco 7500 router is 65536 (64K) entries.

Memory Impact

During times of heavy traffic, the additional flows can fill up the global flow hash table. If you need to increase the size of the global flow hash table, increase the memory of the router.

Cisco IOS Releases 12.2(14)S, 12.0(22)S, or 12.2(15)T

If your router is running a version of Cisco IOS prior to releases 12.2(14)S, 12.0(22)S, or 12.2(15)T the **ip route-cache flow** command is used to enable NetFlow on an interface.

If your router is running Cisco IOS release 12.2(14)S, 12.0(22)S, 12.2(15)T, or later the **ip flow ingress** command is used to enable NetFlow on an interface.

Egress NetFlow Accounting in Cisco IOS 12.3T Releases, 12.3(11)T or Later

The Egress NetFlow Accounting feature captures NetFlow statistics for IP traffic only. MPLS statistics are not captured. The MPLS Egress NetFlow Accounting feature can be used on a provider edge (PE) router to capture IP traffic flow information for egress IP packets that arrived at the router as MPLS packets and underwent label disposition.

Egress NetFlow accounting might adversely affect network performance because of the additional accounting-related computation that occurs in the traffic-forwarding path of the router.

Locally generated traffic (traffic that is generated by the router on which the Egress NetFlow Accounting feature is configured) is not counted as flow traffic for the Egress NetFlow Accounting feature.



Note

In Cisco IOS 12.2S releases, egress NetFlow captures either IPv4 or MPLS packets as they leave the router.

NetFlow Data Export

Restrictions for NetFlow Version 9 Data Export

- Backward compatibility—Version 9 is not backward-compatible with Version 5 or Version 8. If you need Version 5 or Version 8, you must configure it.

- Export bandwidth—Export bandwidth use increases for Version 9 (because of template flowsets) versus Version 5. The increase in bandwidth usage versus Version 5 varies with the frequency with which template flowsets are sent. The default is to resend templates every 20 packets, which has a bandwidth cost of about 4 percent. If necessary, you can lower the resend rate with the **ip flow-export template refresh-rate** *packets* command.
- Performance impact—Version 9 slightly decreases overall performance, because generating and maintaining valid template flowsets require additional processing.

Restrictions for NetFlow Version 8 Export Format

Version 8 export format is available only for aggregation caches, and it cannot be expanded to support new features.

Restrictions for NetFlow Version 5 Export Format

Version 5 export format is suitable only for the main cache, and it cannot be expanded to support new features.

Restrictions for NetFlow Version 1 Export Format

The Version 1 format was the initially released version. Do not use Version 1 format unless you are using a legacy collection system that requires it. Use Version 9 or Version 5 export format.

Information About Configuring NetFlow and NetFlow Data Export

This section contains information that you should understand before you configure NetFlow to analyze network traffic.

- [NetFlow Data Capture, page 3](#)
- [NetFlow Cache Management and Data Export, page 4](#)
- [NetFlow Cache Management and Data Export, page 4](#)
- [NetFlow Export Format Versions 9, 8, 5, and 1, page 5](#)
- [Egress NetFlow Accounting Benefits: NetFlow Accounting Simplified, page 17](#)
- [NetFlow Subinterface Support Benefits: Fine-Tuning Your Data Collection, page 19](#)
- [NetFlow Multiple Export Destinations: Benefits, page 19](#)
- [NetFlow on a Distributed VIP Interface, page 19](#)

NetFlow Data Capture

NetFlow captures data from ingress (incoming) and egress (outgoing) packets. NetFlow gathers statistics for the following ingress IP packets:

- IP-to-IP packets
- IP-to-Multiprotocol Label Switching (MPLS) packets
- Frame Relay-terminated packets
- ATM-terminated packets

NetFlow captures data for all egress (outgoing) packets through the use of the following features:

- Egress NetFlow Accounting—NetFlow gathers statistics for all egress packets for IP traffic only.
- NetFlow MPLS Egress—NetFlow gathers statistics for all egress MPLS-to-IP packets.

NetFlow Flows: Key Fields

A network flow is identified as a unidirectional stream of packets between a given source and destination—both are defined by a network-layer IP address and by transport-layer source and destination port numbers. Specifically, a flow is identified as the combination of the following key fields:

- Source IP address
- Destination IP address
- Source port number
- Destination port number
- Layer 3 protocol type
- Type of service (ToS)
- Input logical interface

These seven key fields define a unique flow. If a packet has one key field different from another packet, it is considered to belong to another flow. A flow might contain other accounting fields (such as the AS number in the NetFlow export Version 5 flow format) that depend on the export record version that you configure. Flows are stored in the NetFlow cache.

NetFlow Cache Management and Data Export

The key components of NetFlow are the NetFlow cache or data source that stores IP flow information, and the NetFlow export or transport mechanism that sends NetFlow data to a network management collector, such as the NetFlow Collection Engine. NetFlow operates by creating a NetFlow cache entry (a flow record) for each active flow. A flow record is maintained within the NetFlow cache for each active flows. Each flow record in the NetFlow cache contains fields that can later be exported to a collection device, such as the NetFlow Collection Engine.

NetFlow is very efficient, the amount of export data being about 1.5 percent of the switched traffic in the router. NetFlow accounts for every packet (non-sampled mode) and provides a highly condensed and detailed view of all network traffic that entered the router or switch.

The key to NetFlow-enabled switching scalability and performance is highly intelligent flow cache management, especially for densely populated and busy edge routers handling large numbers of concurrent, short duration flows. The NetFlow cache management software contains a highly sophisticated set of algorithms for efficiently determining if a packet is part of an existing flow or should generate a new flow cache entry. The algorithms are also capable of dynamically updating per-flow accounting measurements residing in the NetFlow cache, and cache aging/flow expiration determination.

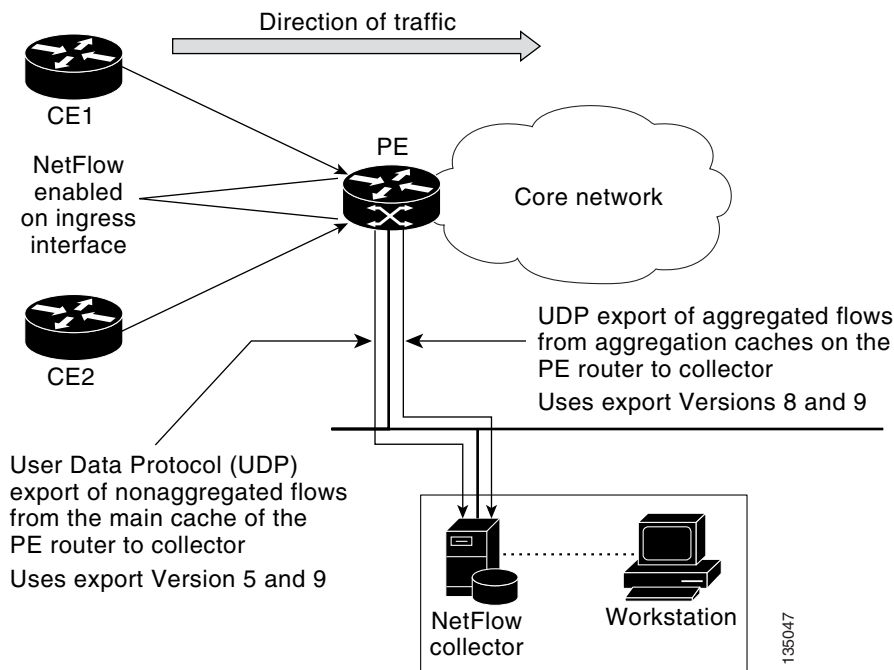
Rules for expiring NetFlow cache entries include:

- Flows which have been idle for a specified time are expired and removed from the cache.
- Long lived flows are expired and removed from the cache. (Flows are not allowed to live more than 30 minutes by default; the underlying packet conversation remains undisturbed.)

- As the cache becomes full a number of heuristics are applied to aggressively age groups of flows simultaneously.
- TCP connections which have reached the end of byte stream (FIN) or which have been reset (RST) are expired.

Expired flows are grouped together into “NetFlow export” datagrams for export from the NetFlow-enabled device. NetFlow export datagrams can consist of up to 30 flow records for Version 5 or Version 9 flow export. NetFlow functionality is configured on a per-interface basis. To configure NetFlow export capabilities, you need to specify the IP address and application port number of the Cisco NetFlow or third-party flow collector. The flow collector is a device that provides NetFlow export data filtering and aggregation capabilities. Figure 1 shows an example of NetFlow data export from the main and aggregation caches to a collector.

Figure 1 NetFlow Data Export from the Main and Aggregation Caches



NetFlow Export Format Versions 9, 8, 5, and 1

Overview

NetFlow exports data in User Datagram Protocol (UDP) datagrams in one of the following formats: Version 9, Version 8, Version 7, Version 5, or Version 1.

- Version 9—A flexible and extensible format, which provides the versatility needed for support of new fields and record types. This format accommodates new NetFlow-supported technologies such as Multicast, Multiprotocol Label Switching (MPLS), and Border Gateway Protocol (BGP) next hop. Version 9 export format enables you to use the same version for main and aggregation caches, and the format is extendable, so you can use the same export format with future features.

- Version 8—A format added to support data export from aggregation caches. Export datagrams contain a subset of the usual Version 5 export data, which is valid for the particular aggregation cache scheme.
- Version 5—A later enhanced version that adds BGP autonomous system (AS) information and flow sequence numbers. (Versions 2 through 4 were not released.) This is the most commonly used format.
- Version 1, the initially released export format, is rarely used today. Do not use the Version 1 export format unless the legacy collection system you are using requires it. Use either the Version 9 export format or the Version 5 export format.

Details

The following sections provide more detailed information on NetFlow Data Export Formats:

- [NetFlow Export Version Formats, page 6](#)
- [NetFlow Export Packet Header Format, page 7](#)
- [NetFlow Flow Record and Export Format Content Information, page 9](#)
- [NetFlow Data Export Format Selection, page 12](#)
- [NetFlow Version 9 Data Export Format, page 12](#)
- [NetFlow Version 8 Data Export Format, page 13](#)
- [NetFlow Version 5 Data Export Format, page 14](#)
- [NetFlow Version 1 Data Export Format, page 16](#)

NetFlow Export Version Formats

For all export versions, the NetFlow export datagram consists of a header and a sequence of flow records. The header contains information such as sequence number, record count, and system uptime. The flow record contains flow information, for example IP addresses, ports, and routing information.

NetFlow Version 9 export format is the newest NetFlow export format. The distinguishing feature of the NetFlow Version 9 export format is that it is template based. Templates make the record format extensible. This feature allows future enhancements to NetFlow without requiring concurrent changes to the basic flow-record format.

The use of templates with the NetFlow Version 9 export format provides several other key benefits:

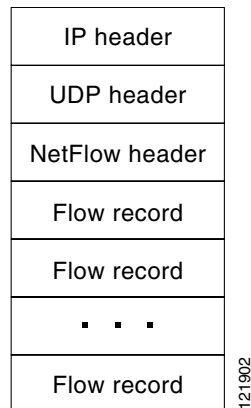
- You can export almost any information from a router or switch including Layer 2 through 7 information, routing information, IP Version 6 (IPv6), IP Version 4 (IPv4), multicast, and Multiprotocol Label Switching (MPLS) information. This new information allows new applications for export data and new views of network behavior.
- Third-party business partners who produce applications that provide collector or display services for NetFlow are not required to recompile their applications each time a new NetFlow export field is added. Instead, they might be able to use an external data file that documents the known template formats.
- New features can be added to NetFlow more quickly, without breaking current implementations.
- NetFlow is “future-proofed” against new or developing protocols, because the Version 9 export format can be adapted to provide support for them and for other non-NetFlow-based approaches to data collection.

The work of the Internet Engineering Task Force (IETF) IP Information Export (IPFIX) Working Group (WG) and the IETF Pack Sampling (PSAMP) WG are based on the NetFlow Version 9 export format.

The Version 1 export format was the original format supported in the initial Cisco IOS software releases containing NetFlow functionality and is rarely used today. The Version 5 export format is a later enhancement that adds Border Gateway Protocol (BGP) autonomous system information and flow sequence numbers. Versions 2 through 4 and Version 6 export formats were either not released or are not supported. Version 8 export format is the NetFlow export format to use when you enable router-based NetFlow aggregation on Cisco IOS router platforms.

Figure 2 shows a typical datagram used for NetFlow fixed format export Versions 1, 5, 7, and 8.

Figure 2 Typical Datagram for NetFlow Fixed Format Export Versions 1, 5, 7, 8

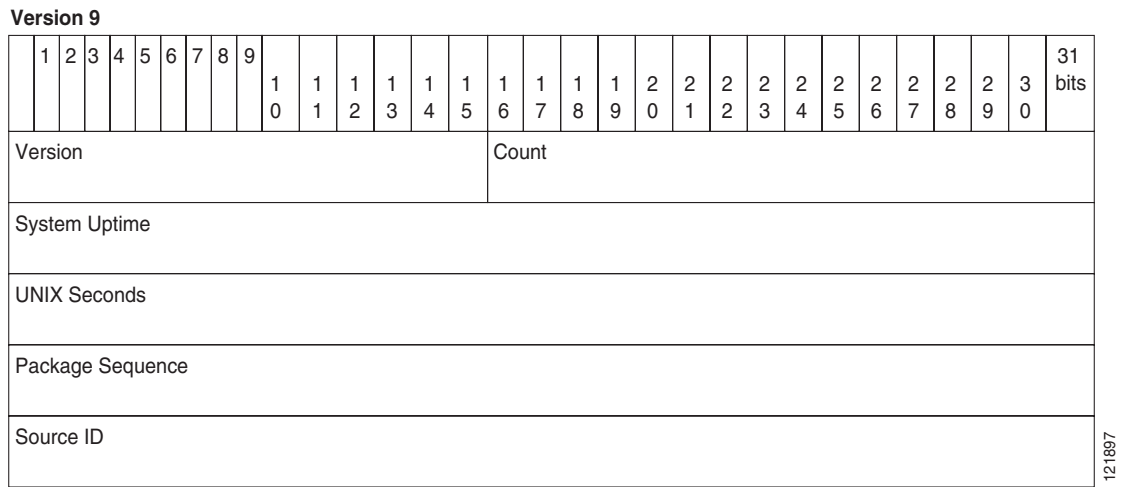


NetFlow Export Packet Header Format

In all five export versions, the datagram consists of a *header* and one or more flow records. The first field of the header contains the version number of the export datagram. Typically, a receiving application that accepts any of the format versions allocates a buffer large enough for the largest possible datagram from any of the format versions and then uses the header to determine how to interpret the datagram. The second field in the header contains the number of records in the datagram (indicating the number of expired flows represented by this datagram). Datagram headers for NetFlow Export Versions 5, 8, and 9 also include a “sequence number” field used by NetFlow collectors to check for lost datagrams.

The NetFlow Version 9 export packet header format is shown in [Figure 3](#).

Figure 3 NetFlow Version 9 Export Packet Header Format



[Table 1](#) lists the NetFlow Version 9 export packet header field names and descriptions.

Table 1 NetFlow Version 9 Export Packet Header Field Names and Descriptions

Field Name	Description
Version	The version of NetFlow records exported in this packet; for Version 9, this value is 0x0009.
Count	Number of FlowSet records (both template and data) contained within this packet.
System Uptime	Time in milliseconds since this device was first booted.
UNIX Seconds	Seconds since 0000 Coordinated Universal Time (UTC) 1970.
Package Sequence	Incremental sequence counter of all export packets sent by this export device; this value is cumulative, and it can be used to find out whether any export packets have been missed. This is a change from the NetFlow Version 5 and Version 8 headers, where this number represented “total flows.”
Source ID	The Source ID field is a 32-bit value that is used to guarantee uniqueness for each flow exported from a particular device. (The Source ID field is the equivalent of the engine type and engine ID fields found in the NetFlow Version 5 and Version 8 headers.) The format of this field is vendor specific. In Cisco’s implementation, the first two bytes are reserved for future expansion, and are always zero. Byte 3 provides uniqueness with respect to the routing engine on the exporting device. Byte 4 provides uniqueness with respect to the particular line card or Versatile Interface Processor on the exporting device. Collector devices should use the combination of the source IP address and the Source ID field to associate an incoming NetFlow export packet with a unique instance of NetFlow on a particular device.

NetFlow Flow Record and Export Format Content Information

This section gives details about the Cisco export format flow record. [Table 2](#) indicates which flow record format fields are available for Version 5, and 9. (Y indicates that the field is available. N indicates that the field is not available.)

Table 2 NetFlow Flow Record Format Fields for Format Versions 5, and 9

Field	Version 5	Version 9
source IP address	Y	Y
destination IP address	Y	Y
source TCP/UDP application port	Y	Y
destination TCP/UDP application port	Y	Y
next hop router IP address	Y	Y
input physical interface index	Y	Y
output physical interface index	Y	Y
packet count for this flow	Y	Y
byte count for this flow	Y	Y
start of flow timestamp	Y	Y
end of flow timestamp	Y	Y
IP Protocol (for example, TCP=6; UDP=17)	Y	Y
Type of Service (ToS) byte	Y	Y
TCP Flags (cumulative OR of TCP flags)	Y	Y
source AS number	Y	Y
destination AS number	Y	Y
source subnet mask	Y	Y
destination subnet mask	Y	Y
flags (indicates, among other things, which flows are invalid)	Y	Y
Other flow fields ¹	N	Y

1. For a list of other flow fields available in Version 9 export format, see [Figure 5](#).

Figure 4 is an example of the NetFlow Version 5 export record format, including the contents and description of byte locations. The terms in **bold** indicate values that were added for the Version 5 format.

Figure 4 NetFlow Version 5 Export Record Format

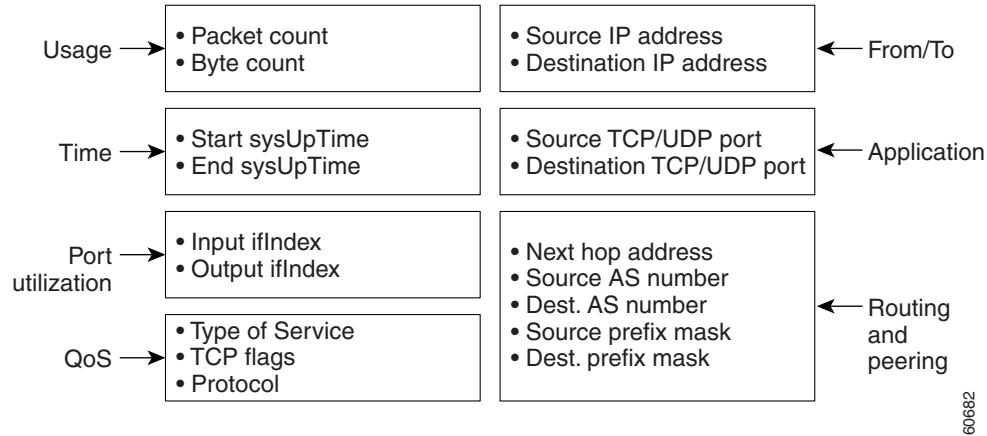


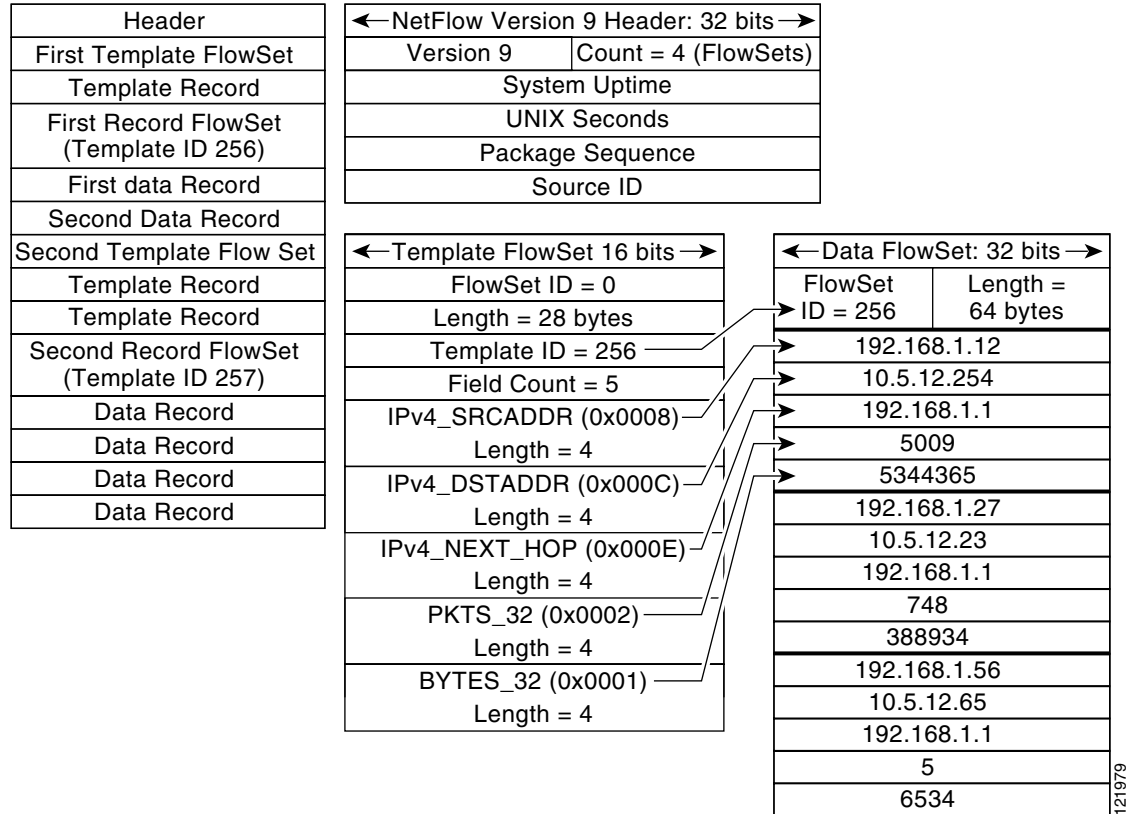
Table 3 shows the field names and descriptions for the NetFlow Version 5 export record format.

Table 3 NetFlow Version 5 Export Record Format Field Names and Descriptions

Content	Bytes	Descriptions
srcaddr	0–3	Source IP address
dstaddr	4–7	Destination IP address
nexthop	8–11	Next hop router's IP address
input	12–13	Ingress interface SNMP ifIndex
output	14–15	Egress interface SNMP ifIndex
dPkts	16–19	Packets in the flow
dOctets	20–23	Octets (bytes) in the flow
first	24–27	SysUptime at start of the flow
last	28–31	SysUptime at the time the last packet of the flow was received
srcport	32–33	Layer 4 source port number or equivalent
dstport	34–35	Layer 4 destination port number or equivalent
pad1	36	Unused (zero) byte
tcp_flags	37	Cumulative OR of TCP flags
prot	38	Layer 4 protocol (for example, 6=TCP, 17=UDP)
tos	39	IP type-of-service byte
src_as	40–41	Autonomous system number of the source, either origin or peer
dst_as	42–43	Autonomous system number of the destination, either origin or peer
src_mask	44	Source address prefix mask bits
dst_mask	45	Destination address prefix mask bits
pad2	46–47	PAD 2 is unused (zero) bytes

Figure 5 shows a typical flow record for the Version 9 export format. The NetFlow Version 9 export record format is different from the traditional NetFlow fixed format export record. In NetFlow Version 9, a template describes the NetFlow data and the flow set contains the actual data. This allows for flexible export. Detailed information about the fields currently in Version 9 and export format architecture are available in the *NetFlow Version 9 Flow-Record Format* document.

Figure 5 NetFlow Version 9 Export Packet Example



For all export versions, you specify a destination where NetFlow data export packets are sent, such as the workstation running NetFlow Collection Engine, either when the number of recently expired flows reaches a predetermined maximum, or every second—whichever occurs first. For a Version 1 datagram, up to 24 flows can be sent in a single UDP datagram of approximately 1200 bytes; for a Version 5 datagram, up to 30 flows can be sent in a single UDP datagram of approximately 1500 bytes.

For detailed information on the flow record formats, data types, and export data fields for Versions 1, 7, and 9 and platform-specific information when applicable, see Appendix 2 in the *NetFlow Solutions Service Guide*.

NetFlow Data Export Format Selection

NetFlow exports data in UDP datagrams in export format Version 9, 8, 5, or 1. [Table 4](#) describes situations when you might select a particular NetFlow export format.

Table 4 When to Select a Particular NetFlow Export Format

Export Format	Select When...
Version 9	You need to export data from various technologies, such as Multicast, DoS, IPv6, BGP next hop, and so on. This format accommodates new NetFlow-supported technologies such as Multicast, MPLS, and BGP next hop. The Version 9 export format supports export from the main cache and from aggregation caches.
Version 8	You need to export data from aggregation caches. Version 8 export format is available only for export from aggregation caches.
Version 5	You need to export data from the NetFlow main cache, and you are not planning to support new features. Version 5 export format does not support export from aggregation caches.
Version 1	You need to export data to a legacy collection system that requires Version 1 export format. Otherwise, do not use Version 1 export format. Use Version 9 or Version 5 export format.

NetFlow Version 9 Data Export Format

The NetFlow Version 9 Export Format feature was introduced in Cisco IOS Release 12.0(24)S and was integrated into Cisco IOS Release 12.3(1) and Cisco IOS Release 12.2(18)S.

NetFlow Version 9 data export supports CEF switching, dCEF switching, and fast switching.

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

Using Version 9 export, you define new formats on the router that you can send to the NetFlow Collection Engine (formerly called NetFlow FlowCollector) at set intervals. You enable the features that you want, and the field values corresponding to those features are sent to the NetFlow Collection Engine.

Third-party business partners who produce applications that provide NetFlow Collection Engine or display services for NetFlow do not need to recompile their applications each time a new NetFlow technology is added. Instead, with the NetFlow v9 Export Format feature, they can use an external data file that documents the known template formats and field types.

In NetFlow Version 9

- Record formats are defined by templates.
- Template descriptions are communicated from the router to the NetFlow Collection Engine.
- Flow records are sent from the router to the NetFlow Collection Engine with minimal template information so that the NetFlow Collection Engine can relate the records to the appropriate template.
- Version 9 is independent of the underlying transport (UDP, TCP, SCTP, and so on).

NetFlow Version 9 Template-Based Flow Record Format

The main feature of NetFlow Version 9 export format is that it is *template based*. A template describes a NetFlow record format and attributes of the fields (such as type and length) within the record. The router assigns each template an ID, which is communicated to the NetFlow Collection Engine along with the template description. The template ID is used for all further communication from the router to the NetFlow Collection Engine.

NetFlow Version 9 Export Flow Records

The basic output of NetFlow is a *flow record*. In NetFlow Version 9 export format, a flow record follows the same sequence of fields as found in the template definition. The template to which NetFlow flow records belong is determined by the prefixing of the template ID to the group of NetFlow flow records that belong to a template. For a complete discussion of existing NetFlow flow-record formats, see the [NetFlow Services Solutions Guide](#).

NetFlow Version 9 Export Packet

In NetFlow Version 9, an export packet consists of the packet header and flowsets. The packet header identifies the new version and provides other information. See [Figure 3 on page 8](#) for Version 9 export packet header details. Flowsets are of two types: template flowsets and data flowsets. The template flowset describes the fields that will be in the data flowsets (or flow records). Each data flowset contains the values or statistics of one or more flows with the same template ID. When the NetFlow Collection Engine receives a template flowset, it stores the flowset and export source address so that subsequent data flowsets that match the flowset ID and source combination are parsed according to the field definitions in the template flowset. Version 9 supports NetFlow Collection Engine Version 4.0. For an example of a Version 9 export packet, see [Figure 5 on page 11](#).

NetFlow Version 8 Data Export Format

The Version 8 data export format is the NetFlow export format used when the router-based NetFlow aggregation feature is enabled on Cisco IOS router platforms. The Version 8 format allows for export datagrams to contain a subset of the Version 5 export data that is based on the configured aggregation cache scheme. For example, a certain subset of the Version 5 export data is exported for the destination prefix aggregation scheme, and a different subset is exported for the source-prefix aggregation scheme.

The Version 8 export format was introduced in Cisco IOS 12.0(3)T for the Cisco IOS NetFlow Aggregation feature. An additional six aggregation schemes that also use Version 8 format were defined for the NetFlow ToS-Based Router Aggregation feature introduced in Cisco IOS 12.0(15)S and integrated into Cisco IOS Releases 12.2(4)T and 12.2(14)S. Refer to the [“Configuring NetFlow Aggregation Caches”](#) module for information on configuring Version 8 data export for aggregation caches.

The Version 8 datagram consists of a header with the version number (which is 8) and time stamp information, followed by one or more records corresponding to individual entries in the NetFlow cache.

Figure 6 displays the NetFlow Version 8 export packet header format.

Figure 6 NetFlow Version 8 Export Packet Header Format

Version 8																														
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31 bits
Version															Count															
System Uptime																														
UNIX Seconds																														
UNIX NanoSeconds																														
Flow Sequence Number																														
Engine Type							Engine ID							Aggregation							Agg Version									
Sampling Interval															Reserved															

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Table 5 lists the NetFlow Version 8 export packet header field names and definitions.

Table 5 NetFlow Version 8 Export Packet Header Field Names and Descriptions

Field Name	Description
Version	Flow export format version number. In this case 8.
Count	Number of export records in the datagram.
System Uptime	Number of milliseconds since the router last booted.
UNIX Seconds	Number of seconds since 0000 UTC 1970.
UNIX NanoSeconds	Number of residual nanoseconds since 0000 UTC 1970.
Flow Sequence Number	Sequence counter of total flows sent for this export stream.
Engine Type	The type of switching engine. RP = 0 and LC = 1.
Engine ID	Slot number of the NetFlow engine.
Aggregation	Type of aggregation scheme being used.
Agg Version	Aggregation subformat version number. The current value is "2."
Sampling Interval	Interval value used if Sampled NetFlow is configured.
Reserved	Zero field.

NetFlow Version 5 Data Export Format

The Version 5 data export format adds support for Border Gateway Protocol (BGP) autonomous system information and flow sequence numbers.

Because NetFlow uses UDP to send export datagrams, datagrams can be lost. The Version 5 header format contains a flow sequence number to find out whether flow export information has been lost. The sequence number is equal to the sequence number of the previous datagram plus the number of flows in the previous datagram. After receiving a new datagram, the receiving application can subtract the expected sequence number from the sequence number in the header to get the number of missed flows.

All fields in Version 5 export format are in network byte order. Figure 7 shows the NetFlow Version 5 export packet header format.

Figure 7 NetFlow Version 5 Export Packet Header Format

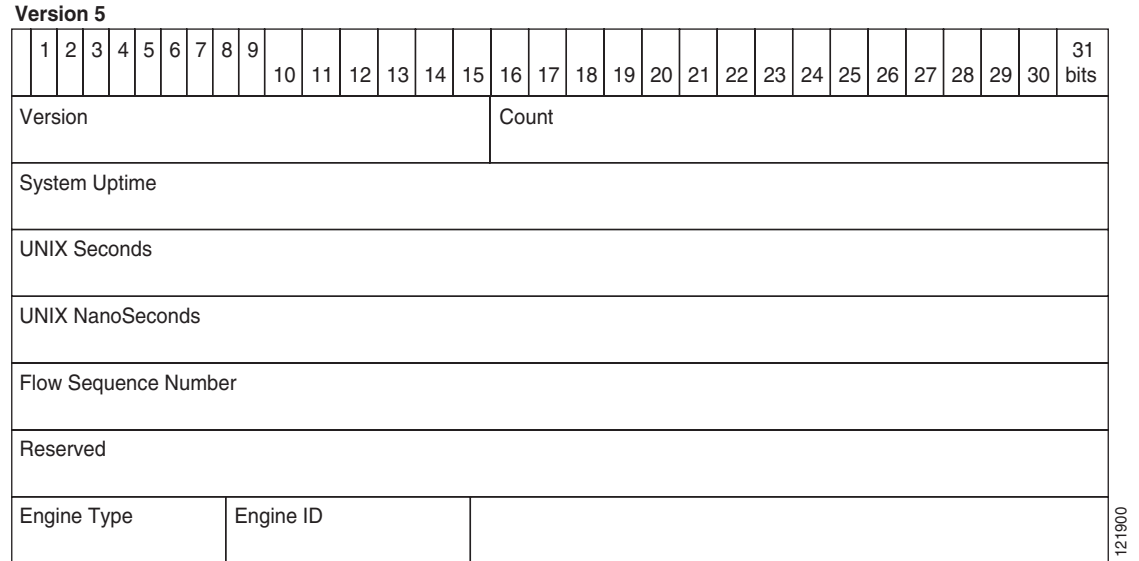


Table 6 lists the NetFlow Version 5 export packet header field names and descriptions.

Table 6 NetFlow Version 5 Export Packet Header Field Names and Descriptions

Field	Description
Version	Version of NetFlow records exported in this packet.
Count	Number of FlowSet records (both template and data) contained within this packet.
System Uptime	Time in milliseconds since this device was first booted.
UNIX Seconds	Seconds since 0000 UTC 1970.
UNIX NanoSeconds	Residual nanoseconds since 0000 UTC 1970.
Flow Sequence Number	Sequence number of total flows seen.
Reserved	Zero field.
Engine Type	Type of flow switching engine: 0 for RP, 1 for VIP/LC.
Engine ID	VIP or LC slot number of the flow switching engine.

Table 7 describes the Version 5 export format header network byte order.

Table 7 NetFlow Version 5 Export Format Header Network Byte Order

Bytes	Content	Description
0 to 3	Version and count	NetFlow export format version number and number of flows exported in this packet (1 to 30)
4 to 7	SysUptime	Current time (in milliseconds) since the router booted
8 to 11	unix_secs	Seconds since 0000 UTC 1970
12 to 15	unix_nsecs	Residual nanoseconds since 0000 UTC 1970
16 to 19	flow_sequence	Sequence counter of total flows seen
20 to 23	Reserved	Unused (zero) bytes

Table 8 lists the byte definitions for the Version 5 flow record format.

Table 8 Version 5 Flow Record Format

Bytes	Content	Description
0 to 3	srcaddr	Source IP address.
4 to 7	dstaddr	Destination IP address.
8 to 11	nexthop	IP address of the next hop router.
12 to 15	input and output	SNMP index of the input and output interfaces.
16 to 19	dPkts	Packets in the flow.
20 to 23	dOctets	Total number of Layer 3 bytes in the flow's packets.
24 to 27	First	SysUptime at start of flow.
28 to 31	Last	SysUptime at the time the last packet of flow was received.
32 to 35	srcport and dstport	TCP/UDP source and destination port number or equivalent.
36 to 39	pad1, tcp_flags, prot, and tos	Unused (zero) byte, cumulative OR of TCP flags, IP protocol (for example, 6 = TCP, 17 = UDP), and IP ToS.
40 to 43	src_as and dst_as	Autonomous system of the source and destination, either origin or peer.
44 to 47	src_mask, dst_mask, and pad2	Source and destination address prefix mask bits. Pad 2 is unused (zero) bytes.

NetFlow Version 1 Data Export Format

The NetFlow Version 1 data export format was the format supported in the initial Cisco IOS software releases containing NetFlow functionality. It is rarely used today. Do not use the Version 1 export format unless the legacy collection system you are using requires it. Use either the Version 9 export format or the Version 5 export format.

Figure 8 shows the NetFlow Version 1 export packet header format.

Figure 8 Version 1 Export Packet Header Format

Version 1

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31 bits
Version															Count															
System Uptime																														
UNIX Seconds																														
UNIX NanoSeconds																														

121901

Table 9 lists the NetFlow Version 1 export packet header field names and descriptions.

Table 9 NetFlow Version 1 Packet Header Field Names and Descriptions

Field Name	Description
Version	Version of NetFlow records exported in this packet.
Count	Number of FlowSet records (both template and data) contained within this packet.
System Uptime	Time in milliseconds since this device was first booted.
UNIX Seconds	Seconds since 0000 UTC 1970.
UNIX NanoSeconds	Residual nanoseconds since 0000 UTC 1970.

Egress NetFlow Accounting Benefits: NetFlow Accounting Simplified

The Egress NetFlow Accounting feature can simplify NetFlow configuration. The following example shows how.

In Figure 9 and Figure 10 both incoming and outgoing (ingress and egress) flow statistics are required for the server. The server is attached to Router B. The “cloud” in the figure represents the core of the network and includes Multiprotocol Label Switching (MPLS) Virtual Private Networks (VPNs).

All traffic denoted by the arrows must be accounted for. The solid arrows represent IP traffic and the dotted arrows represent MPLS VPNs.

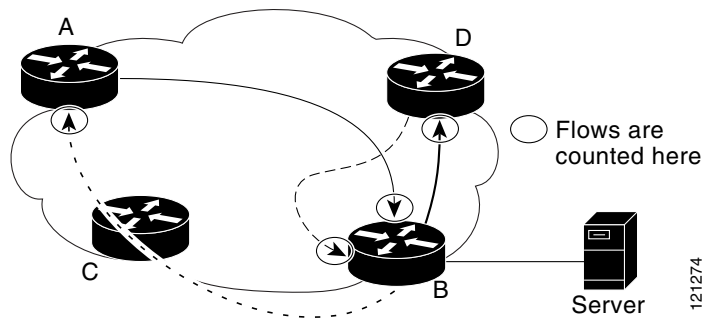
Figure 9 shows how the flow traffic was tracked before the introduction of the Egress NetFlow Accounting feature. Figure 10 shows how the flow traffic is tracked after the introduction of the Egress NetFlow Accounting feature. The Egress NetFlow Accounting feature simplifies configuration tasks and makes it easier for you to collect and track incoming and outgoing flow statistics for the server in this example.

Since only ingress flows could be tracked before the Egress NetFlow Accounting feature was introduced, the following NetFlow configurations had to be implemented for the tracking of ingress and egress flows from Router B:

- Enable NetFlow on an interface on Router B to track ingress IP traffic from Router A to Router B.
- Enable NetFlow on an interface on Router D to track ingress IP traffic from Router B to Router D.

- Enable NetFlow on an interface on Router A to track ingress traffic from the MPLS VPN from Router B to Router A.
- Enable NetFlow on an interface on Router B to track ingress traffic from the MPLS VPN from Router D to Router B.

Figure 9 Ingress-Only NetFlow Example



A configuration such as the one used in [Figure 9](#) requires that NetFlow statistics from three separate routers be added together to obtain the flow statistics for the server.

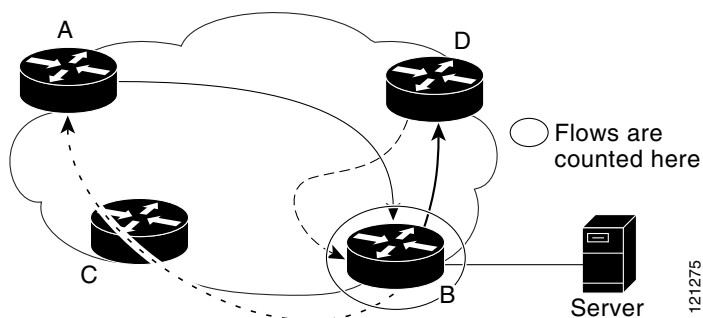
In comparison, the example in [Figure 10](#) shows NetFlow, the Egress NetFlow Accounting feature, and the MPLS Egress NetFlow Accounting feature being used to capture ingress and egress flow statistics for Router B, thus obtaining the required flow statistics for the server.

In [Figure 10](#), the following NetFlow configurations are applied to Router B:

- Enable NetFlow on an interface on Router B to track ingress IP traffic from Router A to Router B.
- Enable the Egress NetFlow Accounting feature on an interface on Router B to track egress IP traffic from Router B to Router D.
- Enable NetFlow on an interface on Router B to track ingress traffic from the MPLS VPN from Router B to Router D.
- Enable NetFlow on an interface on Router B to track ingress traffic from the MPLS VPN from Router B to Router A.

After NetFlow is configured on Router B, you can display all NetFlow statistics for the server by entering the `show ip cache flow` command or the `show ip cache verbose flow` command for Router B.

Figure 10 Egress NetFlow Accounting Example



NetFlow Subinterface Support Benefits: Fine-Tuning Your Data Collection

You can configure NetFlow on a per-subinterface basis. If your network contains thousands of subinterfaces and you want to collect export records from only a few subinterfaces, you can do that. The result is lower bandwidth requirements for NetFlow data export and reduced platform requirements for NetFlow data-collection devices.

The configuration of NetFlow on selected subinterfaces provides the following benefits:

- Reduced bandwidth requirement between routing devices and NetFlow management workstations.
- Reduced NetFlow workstation requirements; the number of flows sent to the workstation for processing is reduced.

NetFlow Multiple Export Destinations: Benefits

The NetFlow Multiple Export Destinations feature enables configuration of multiple destinations for the NetFlow data. With this feature enabled, two identical streams of NetFlow data are sent to the destination host. Currently, the maximum number of export destinations allowed is two.

The NetFlow Multiple Export Destinations feature improves the chances of receiving complete NetFlow data because it provides redundant streams of data. Because the same export data is sent to more than one NetFlow collector, fewer packets are lost.

NetFlow on a Distributed VIP Interface

On a Cisco 7500 series router with an Route Switch Processor (RSP) and with VIP controllers, the VIP hardware can be configured to switch packets received by the VIP interfaces with no per-packet intervention on the part of the RSP. This process is called *distributed switching*. When VIP distributed switching is enabled, the input VIP interface switches IP packets instead of forwarding them to the RSP for switching. Distributed switching decreases the demand on the RSP. VIP interfaces with distributed switching enabled can be configured for NetFlow.

How to Configure NetFlow and NetFlow Data Export

This section contains instructions for configuring NetFlow to capture and export network traffic data. Perform the following tasks to configure NetFlow to capture and export network traffic data:

- [Configuring NetFlow, page 20](#) (required)
- [Verifying that NetFlow is Operational and View NetFlow Statistics, page 21](#) (optional)
- [Configuring NetFlow Data Export Using the Version 9 Export Format, page 23](#) (optional)
- [Verifying that NetFlow Data Export is Operational, page 26](#) (optional)
- [Clearing NetFlow Statistics on the Router, page 27](#) (optional)
- [Customizing the NetFlow Main Cache Parameters, page 28](#) (optional)

Configuring NetFlow

Perform the steps in this required task to enable NetFlow.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-type interface-number*
4. **ip flow** {ingress | egress}
5. **exit**
6. Repeat Steps 3 through 5 to enable NetFlow on other interfaces
7. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	(Required) Enables privileged EXEC mode. <ul style="list-style-type: none">• Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	(Required) Enters global configuration mode.
Step 3	interface <i>interface-type interface-number</i> Example: Router(config)# interface ethernet 0/0	(Required) Specifies the interface that you want to enable NetFlow on and enters interface configuration mode.
Step 4	ip flow {ingress egress} Example: Router(config-if)# ip flow ingress or Example: Router(config-if)# ip flow egress	(Required) Enables NetFlow on the interface. <ul style="list-style-type: none">• ingress—captures traffic that is being received by the interface• egress—captures traffic that is being transmitted by the interface <p>This is the Egress NetFlow Accounting feature that is described in the “Egress NetFlow Accounting Benefits: NetFlow Accounting Simplified” section on page 17.</p>
Step 5	exit Example: Router(config-if)# exit	(Optional) Exits interface configuration mode and returns to global configuration mode. Note You only need to use this command if you want to enable NetFlow on another interface.

	Command or Action	Purpose
Step 6	Repeat Steps 3 through 5 to enable NetFlow on other interfaces	(Optional) —
Step 7	<code>end</code>	(Required) Exits the current configuration mode and returns to privileged EXEC mode.
	Example: <code>Router(config-if)# end</code>	

Verifying that NetFlow is Operational and View NetFlow Statistics

Perform the steps in this optional task to verify that NetFlow is operational and to view the NetFlow statistics.

SUMMARY STEPS

1. `show ip flow interface`
2. `show ip cache flow`
3. `show ip cache verbose flow`

DETAILED STEPS

Step 1 `show ip flow interface`

Use this command to display the NetFlow configuration for an interface. The following is sample output from this command:

```
Router# show ip flow interface
Ethernet0/0
  ip flow ingress
Router#
```

Step 2 `show ip cache flow`

Use this command to verify that NetFlow is operational, and to display a summary of the NetFlow statistics. The following is sample output from this command:

```
Router# show ip cache flow
IP packet size distribution (1103746 total packets):
  1-32   64   96  128  160  192  224  256  288  320  352  384  416  448  480
  .249 .694 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000

      512  544  576 1024 1536 2048 2560 3072 3584 4096 4608
      .000 .000 .027 .000 .027 .000 .000 .000 .000 .000 .000

IP Flow Switching Cache, 278544 bytes
 35 active, 4061 inactive, 980 added
2921778 aged polls, 0 flow alloc failures
Active flows timeout in 30 minutes
Inactive flows timeout in 15 seconds
IP Sub Flow Cache, 21640 bytes
 0 active, 1024 inactive, 0 added, 0 added to flow
 0 alloc failures, 0 force free
 1 chunk, 1 chunk added
last clearing of statistics never
Protocol          Total      Flows   Packets Bytes   Packets Active(Sec) Idle(Sec)
```

```

-----
Flows      /Sec      /Flow /Pkt      /Sec      /Flow      /Flow
TCP-FTP    108      0.0    1133   40      2.4    1799.6    0.9
TCP-FTPD   108      0.0    1133   40      2.4    1799.6    0.9
TCP-WWW    54       0.0    1133   40      1.2    1799.6    0.8
TCP-SMTP   54       0.0    1133   40      1.2    1799.6    0.8
TCP-BGP    27       0.0    1133   40      0.6    1799.6    0.7
TCP-NNTP   27       0.0    1133   40      0.6    1799.6    0.7
TCP-other  297      0.0    1133   40      6.8    1799.7    0.8
UDP-TFTP   27       0.0    1133   28      0.6    1799.6    1.0
UDP-other  108      0.0    1417   28      3.1    1799.6    0.9
ICMP       135      0.0    1133   427     3.1    1799.6    0.8
Total:     945      0.0    1166   91     22.4    1799.6    0.8

SrcIf      SrcIPAddress  DstIf      DstIPAddress  Pr SrcP DstP  Pkts
Et0/0     192.168.67.6  Et1/0.1    172.16.10.200 01 0000 0C01 51
Et0/0     10.10.18.1    Null       172.16.11.5    11 0043 0043 51
Et0/0     10.10.18.1    Null       172.16.11.5    11 0045 0045 51
Et0/0     10.234.53.1   Et1/0.1    172.16.10.2    01 0000 0800 51
Et0/0     10.10.19.1    Null       172.16.11.6    11 0044 0044 51
Et0/0     10.10.19.1    Null       172.16.11.6    11 00A2 00A2 51
Et0/0     192.168.87.200 Et1/0.1    172.16.10.2    06 0014 0014 50
Et0/0     192.168.87.200 Et1/0.1    172.16.10.2    06 0015 0015 52
.
.
.
Et0/0     172.16.1.84   Et1/0.1    172.16.10.19   06 0087 0087 50
Et0/0     172.16.1.84   Et1/0.1    172.16.10.19   06 0050 0050 51
Et0/0     172.16.1.85   Et1/0.1    172.16.10.20   06 0089 0089 49
Et0/0     172.16.1.85   Et1/0.1    172.16.10.20   06 0050 0050 50
Et0/0     10.251.10.1   Et1/0.1    172.16.10.2    01 0000 0800 51
Et0/0     10.162.37.71  Null       172.16.11.3    06 027C 027C 49
Router#

```

Step 3 show ip cache verbose flow

Use this command to verify that NetFlow is operational and to display a detailed summary of the NetFlow statistics. The following is sample output from this command:

```

Router# show ip cache verbose flow
IP packet size distribution (1130681 total packets):
  1-32  64  96 128 160 192 224 256 288 320 352 384 416 448 480
    .249 .694 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000 .000

    512 544 576 1024 1536 2048 2560 3072 3584 4096 4608
    .000 .000 .027 .000 .027 .000 .000 .000 .000 .000 .000 .000

IP Flow Switching Cache, 278544 bytes
  35 active, 4061 inactive, 980 added
  2992518 aged polls, 0 flow alloc failures
  Active flows timeout in 30 minutes
  Inactive flows timeout in 15 seconds
IP Sub Flow Cache, 21640 bytes
  0 active, 1024 inactive, 0 added, 0 added to flow
  0 alloc failures, 0 force free
  1 chunk, 1 chunk added
  last clearing of statistics never
Protocol      Total      Flows      Packets Bytes  Packets Active(Sec) Idle(Sec)
-----
Flows        /Sec      /Flow /Pkt      /Sec      /Flow      /Flow
TCP-FTP       108      0.0    1133   40      2.4    1799.6    0.9
TCP-FTPD      108      0.0    1133   40      2.4    1799.6    0.9
TCP-WWW       54       0.0    1133   40      1.2    1799.6    0.8
TCP-SMTP      54       0.0    1133   40      1.2    1799.6    0.8
TCP-BGP       27       0.0    1133   40      0.6    1799.6    0.7
TCP-NNTP      27       0.0    1133   40      0.6    1799.6    0.7
TCP-other     297      0.0    1133   40      6.6    1799.7    0.8

```

UDP-TFTP	27	0.0	1133	28	0.6	1799.6	1.0
UDP-other	108	0.0	1417	28	3.0	1799.6	0.9
ICMP	135	0.0	1133	427	3.0	1799.6	0.8
Total:	945	0.0	1166	91	21.9	1799.6	0.8

SrcIf	SrcIPAddress	DstIf	DstIPAddress	Pr	TOS	Flgs	Pkts
Port Msk AS		Port Msk AS	NextHop			B/Pk	Active
Et0/0	192.168.67.6	Et1/0.1	172.16.10.200	01	00	10	799
0000 /0 0		0C01 /0 0	0.0.0.0			28	1258.1
Et0/0	10.10.18.1	Null	172.16.11.5	11	00	10	799
0043 /0 0		0043 /0 0	0.0.0.0			28	1258.0
Et0/0	10.10.18.1	Null	172.16.11.5	11	00	10	799
0045 /0 0		0045 /0 0	0.0.0.0			28	1258.0
Et0/0	10.234.53.1	Et1/0.1	172.16.10.2	01	00	10	799
0000 /0 0		0800 /0 0	0.0.0.0			28	1258.1
Et0/0	10.10.19.1	Null	172.16.11.6	11	00	10	799
0044 /0 0		0044 /0 0	0.0.0.0			28	1258.1
.							
.							
Et0/0	172.16.1.84	Et1/0.1	172.16.10.19	06	00	00	799
0087 /0 0		0087 /0 0	0.0.0.0			40	1258.1
Et0/0	172.16.1.84	Et1/0.1	172.16.10.19	06	00	00	799
0050 /0 0		0050 /0 0	0.0.0.0			40	1258.0
Et0/0	172.16.1.85	Et1/0.1	172.16.10.20	06	00	00	798
0089 /0 0		0089 /0 0	0.0.0.0			40	1256.5
Et0/0	172.16.1.85	Et1/0.1	172.16.10.20	06	00	00	799
0050 /0 0		0050 /0 0	0.0.0.0			40	1258.0
Et0/0	10.251.10.1	Et1/0.1	172.16.10.2	01	00	10	799
0000 /0 0		0800 /0 0	0.0.0.0			1500	1258.1
Et0/0	10.162.37.71	Null	172.16.11.3	06	00	00	798
027C /0 0		027C /0 0	0.0.0.0			40	1256.4
Router#							

Configuring NetFlow Data Export Using the Version 9 Export Format

Perform the steps in this optional task to configure NetFlow Data Export using the Version 9 export format.



Note

This task does not include instructions for configuring Reliable NetFlow Data Export using SCTP. Refer to the “[NetFlow Reliable Export With SCTP](#)” module for information about, and instructions for configuring Reliable NetFlow Data Export using SCTP.

This section contains the following subsections:

- [Prerequisites, page 23](#)
- [SUMMARY STEPS, page 24](#)
- [DETAILED STEPS, page 24](#)

Prerequisites


This task does not include the steps for configuring NetFlow. You must configure NetFlow by enabling it on at least one interface in the router in order to export traffic data with NetFlow Data Export. Refer to the “[Configuring NetFlow](#)” section on [page 20](#) for information about configuring NetFlow.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **ip flow-export destination** *{{ip-address | hostname} udp-port}*
4. Repeat Step 3 once to configure an additional export destination
5. **ip flow-export source** *interface-type interface-number*
6. **ip flow-export version 9** [**origin-as** | **peer-as**] [**bgp-next-hop**]
7. **ip flow-export interface-names**
8. **ip flow-export template refresh-rate** *packets*
9. **ip flow-export template timeout-rate** *minutes*
10. **ip flow-export template options export-stats**
11. **ip flow-export template options refresh-rate** *packets*
12. **ip flow-export template options timeout-rate** *minutes*
13. **end**

DETAILED STEPS

	Command	Purpose
Step 1	enable Example: Router> enable	(Required) Enters privileged EXEC mode. <ul style="list-style-type: none"> • Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	(Required) Enters global configuration mode.
Step 3	ip flow-export destination <i>{{ip-address hostname} udp-port}</i> Example: Router(config)# ip flow-export destination 172.16.10.2 99	(Required) Specifies the IP address, or hostname of the NetFlow collector, and the UDP port the NetFlow collector is listening on.
Step 4	Repeat Step 3 once to configure a second NetFlow export destination.	(Optional) You can configure a maximum of two export destinations for NetFlow. This is the NetFlow Multiple Export Destinations feature that is described in the “NetFlow Multiple Export Destinations: Benefits” section on page 19 .
Step 5	ip flow-export source <i>interface-type interface-number</i> Example: Router(config)# ip flow-export source ethernet 0/0	(Optional) The IP address from the interface specified is used as the source IP address for the UDP datagrams that are sent by NetFlow data export to the destination host.

Command	Purpose
<p>Step 6</p> <pre>ip flow-export version 9 [origin-as peer-as] [bgp-nexthop]</pre> <p>Example: Router(config)# ip flow-export version 9</p>	<p>(Optional) Enables the export of information in NetFlow cache entries.</p> <ul style="list-style-type: none"> • The version 9 keyword specifies that the export packet uses the Version 9 format. • The origin-as keyword specifies that export statistics include the originating AS for the source and destination. • The peer-as keyword specifies that export statistics include the peer AS for the source and destination. • The bgp-nexthop keyword specifies that export statistics include BGP next hop-related information. <p> Caution Entering this command on a Cisco 12000 Series Internet Router causes packet forwarding to stop for a few seconds while NetFlow reloads the route processor and line card CEF tables. To avoid interruption of service to a live network, apply this command during a change window, or include it in the startup-config file to be executed during a router reboot.</p>
<p>Step 7</p> <pre>ip flow-export interface-names</pre> <p>Example: Router(config)# ip flow-export interface-names</p>	<p>Configures NetFlow data export to include the interface names from the flows when it exports the NetFlow cache entry to a destination system.</p>
<p>Step 8</p> <pre>ip flow-export template refresh-rate packets</pre> <p>Example: Router(config)# ip flow-export template refresh-rate 15</p>	<p>(Optional) Enables the export of information in NetFlow cache entries.</p> <ul style="list-style-type: none"> • The template keyword specifies template-specific configurations. • The refresh-rate packets keyword-argument pair specifies the number of packets exported before the templates are resent. You can specify from 1 to 600 packets. The default is 20 packets.
<p>Step 9</p> <pre>ip flow-export template timeout-rate minutes</pre> <p>Example: Router(config)# ip flow-export template timeout-rate 90</p>	<p>(Optional) Enables the export of information in NetFlow cache entries.</p> <ul style="list-style-type: none"> • The template keyword specifies that the timeout-rate keyword applies to the template. • The timeout-rate minutes keyword-argument pair specifies the time elapsed before the templates are resent. You can specify from 1 to 3600 minutes. The default is 30 minutes.

	Command	Purpose
Step 10	<pre>ip flow-export template options export-stats</pre> <p>Example: Router(config)# ip flow-export template options export-stats</p>	<p>(Optional) Enables the export of information in NetFlow cache entries.</p> <ul style="list-style-type: none"> The template keyword specifies template-specific configurations. The options keyword specifies template options. The export-stats keyword specifies that the export statistics include the total number of flows exported and the total number of packets exported.
Step 11	<pre>ip flow-export template options refresh-rate packets</pre> <p>Example: Router(config)# ip flow-export template options refresh-rate 25</p>	<p>(Optional) Enables the export of information in NetFlow cache entries.</p> <ul style="list-style-type: none"> The template keyword specifies template-specific configurations. The options keyword specifies template options. The refresh-rate packets keyword-argument pair specifies the number of packets exported before the templates are resent. You can specify from 1 to 600 packets. The default is 20 packets.
Step 12	<pre>ip flow-export template options timeout-rate minutes</pre> <p>Example: Router(config)# ip flow-export template options timeout-rate 120</p>	<p>(Optional) Enables the export of information in NetFlow cache entries.</p> <ul style="list-style-type: none"> The template keyword specifies template-specific configurations. The options keyword specifies template options. The timeout-rate minutes keyword-argument pair specifies the time elapsed before the templates are resent. You can specify from 1 to 3600 minutes. The default is 30 minutes.
Step 13	<pre>end</pre> <p>Example: Router(config)# end</p>	<p>(Required) Exits the current configuration mode and returns to privileged EXEC mode.</p>

Verifying that NetFlow Data Export is Operational

Perform the steps in this optional task to verify that NetFlow data export is operational and how to view the statistics for NetFlow data export.

SUMMARY STEPS

1. **show ip flow export**
2. **show ip flow export template**

DETAILED STEPS

Step 1 show ip flow export

Use this command to display the statistics for the NetFlow data export, including statistics for the main cache and for all other enabled caches. The following is sample output from this command:

```
Router# show ip flow export
Flow export v9 is enabled for main cache
  Exporting flows to 172.16.10.2 (99)
  Exporting using source interface Ethernet0/0
  Version 9 flow records
  0 flows exported in 0 udp datagrams
  0 flows failed due to lack of export packet
  0 export packets were sent up to process level
  0 export packets were dropped due to no fib
  0 export packets were dropped due to adjacency issues
  0 export packets were dropped due to fragmentation failures
  0 export packets were dropped due to encapsulation fixup failures
Router#
```

Step 2 show ip flow export template

Use this command to display the statistics for the NetFlow data export (such as the template timeout rate and the refresh rate) for the template-specific configurations. The following is sample output from this command:

```
Router# show ip flow export template
  Template Options Flag = 1
  Total number of Templates added = 1
  Total active Templates = 1
  Flow Templates active = 0
  Flow Templates added = 0
  Option Templates active = 1
  Option Templates added = 1
  Template ager polls = 0
  Option Template ager polls = 140
Main cache version 9 export is enabled
  Template export information
  Template timeout = 90
  Template refresh rate = 15
  Option export information
  Option timeout = 120
  Option refresh rate = 25
Router#
```

Clearing NetFlow Statistics on the Router

Perform the steps in this optional task to clear NetFlow statistics on the router.

SUMMARY STEPS

1. enable
1. clear ip flow stats

DETAILED STEPS

Step 1 enable

Use this enter privileged EXEC mode on the router:

```
Router> enable
Router#
```

Step 2 clear ip flow stats

Use this command to clear the NetFlow statistics on the router. For example:

```
Router# clear ip flow stats
```

Customizing the NetFlow Main Cache Parameters

NetFlow operates by creating a NetFlow cache entry (a flow record) for each active flow. A flow record is maintained within the NetFlow cache for all active flows. Each flow record in the NetFlow cache contains fields that can later be exported to a collection device, such as the NetFlow Collection Engine. NetFlow enables the accumulation of data on flows. Each flow is identified by unique characteristics such as IP address, interface, application, and type of service (ToS).

To customize the parameters for the main NetFlow cache, perform the steps this optional task. This section contains the following subsections:

- [NetFlow Cache Entry Management on a Routing Device, page 28](#)
- [NetFlow Cache Size, page 29](#)
- [Restrictions, page 29](#)
- [SUMMARY STEPS, page 29](#)
- [DETAILED STEPS, page 30](#)

NetFlow Cache Entry Management on a Routing Device

The routing device checks the NetFlow cache once per second and causes the flow to expire in the following instances:

- Flow transport is completed (TCP connections that have reached the end of the byte stream [FIN] or which have been reset [RST] are expired).
- The flow cache has become full.
- A flow becomes inactive. By default, a flow unaltered in the last 15 seconds is classified as inactive.
- An active flow has been monitored for a specified number of minutes. By default, active flows are flushed from the cache when they have been monitored for 30 minutes.

Routing device default timer settings are 15 seconds for the inactive timer and 30 minutes for the active timer. You can configure your own time interval for the inactive timer between 10 and 600 seconds. You can configure the time interval for the active timer between 1 and 60 minutes.

NetFlow Cache Size

After you enable NetFlow on an interface, NetFlow reserves memory to accommodate a number of entries in the NetFlow cache. Normally the size of the NetFlow cache meets the needs of your NetFlow traffic rates. The cache default size is 64K flow cache entries. Each cache entry requires 64 bytes of storage. About 4 MB of DRAM are required for a cache with the default number of entries. You can increase or decrease the number of entries maintained in the cache, if required. For environments with a large amount of flow traffic (such as an internet core router), we recommend a larger value such as 131072 (128K). To obtain information on your flow traffic, use the **show ip cache flow**.

A NetFlow cache can be resized depending on the platform and the amount of DRAM on a line card. For example, the NetFlow cache size is configurable for software-based platforms such as Cisco 75xx and 72xx series routers. The amount of memory on a Cisco 12000 line card determines how many flows are possible in the cache.

Using the **ip flow-cache entries** command, you can configure the size of your NetFlow cache between 1024 entries and 524,288 entries. Using the **cache entries** command (after you configure NetFlow aggregation), you can configure the size of the NetFlow aggregation cache from 1024 entries to 524,288 entries.



Caution

We recommend that you not change the values for NetFlow cache entries. Improper use of this feature could cause network problems. To return to the default value for NetFlow cache entries, use the **no ip flow-cache entries** global configuration command.

Restrictions

If you modify any parameters for the NetFlow main cache after you enable NetFlow the changes will not take effect until you reboot the router or disable NetFlow on every interface it is enabled on, and then re-enable NetFlow on the interfaces.

SUMMARY STEPS

1. **enable**
2. **configure terminal**
3. **interface** *interface-type interface-number*
4. **no ip flow** {**ingress** | **egress**}
5. **exit**
6. Repeat Steps 3 through 5 for every interface that has NetFlow enabled on it
7. **ip flow-cache entries** *number*
8. **ip flow-cache timeout active** *minutes*
9. **ip flow-cache timeout inactive** *seconds*
10. **interface** *interface-type interface-number*
11. **ip flow** {**ingress** | **egress**}
12. **exit**
13. Repeat Steps 10 through 12 for every interface that previously had NetFlow enabled on it
14. **end**

DETAILED STEPS

	Command or Action	Purpose
Step 1	enable Example: Router> enable	(Required) Enables privileged EXEC mode. <ul style="list-style-type: none">Enter your password if prompted.
Step 2	configure terminal Example: Router# configure terminal	(Required) Enters global configuration mode.
Step 3	interface <i>interface-type interface-number</i> Example: Router(config)# interface ethernet 0/0	(Required if NetFlow is already enabled on the interface) Specifies the interface that you want to disable NetFlow on and enters interface configuration mode.
Step 4	no ip flow {ingress egress} Example: Router(config-if)# no ip flow ingress or Example: Router(config-if)# no ip flow egress	(Required if NetFlow is enabled on the interface) Disables NetFlow on the interface. <ul style="list-style-type: none">ingress—captures traffic that is being received by the interfaceegress—captures traffic that is being transmitted by the interface
Step 5	exit Example: Router(config-if)# exit	(Optional) Exits interface configuration mode and returns to global configuration mode. Note You only need to use this command if you need to disable NetFlow on another interface.
Step 6	Repeat Steps 3 through 5 for the remaining interfaces that have NetFlow enabled on them.	(Required if NetFlow is enabled on any other interfaces) —
Step 7	ip flow-cache entries <i>number</i> Example: Router(config)# ip flow-cache entries 131072	(Optional) Changes the number of entries maintained in the NetFlow cache. <ul style="list-style-type: none">The <i>number</i> argument is the number of entries to be maintained. The valid range is from 1024 to 524288 entries. The default is 65536 (64K).
Step 8	ip flow-cache timeout active <i>minutes</i> Example: Router(config)# ip flow-cache timeout active 20	(Optional) Specifies flow cache timeout parameters. <ul style="list-style-type: none">The active keyword specifies the active flow timeout.The <i>minutes</i> argument specifies the number of minutes that an active flow remains in the cache before the flow times out. The range is from 1 to 60. The default is 30.

	Command or Action	Purpose
Step 9	<p><code>ip flow-cache timeout inactive seconds</code></p> <p>Example: <pre>Router(config)# ip flow-cache timeout inactive 130</pre></p>	<p>(Optional) Specifies flow cache timeout parameters.</p> <ul style="list-style-type: none"> The inactive keyword specifies the inactive flow timeout. The <i>seconds</i> argument specifies the number of seconds that an inactive flow remains in the cache before it times out. The range is from 10 to 600. The default is 15
Step 10	<p><code>interface interface-type interface-number</code></p> <p>Example: <pre>Router(config)# interface ethernet 0/0</pre></p>	<p>(Required) Specifies the interface that you want to enable NetFlow on and enters interface configuration mode.</p>
Step 11	<p><code>ip flow {ingress egress}</code></p> <p>Example: <pre>Router(config-if)# ip flow ingress</pre> or <pre>Router(config-if)# ip flow egress</pre></p>	<p>(Required) Enables NetFlow on the interface.</p> <ul style="list-style-type: none"> ingress—captures traffic that is being received by the interface egress—captures traffic that is being transmitted by the interface
Step 12	<p><code>exit</code></p> <p>Example: <pre>Router(config-if)# exit</pre></p>	<p>(Optional) Exits interface configuration mode and returns to global configuration mode.</p> <p>Note You only need to use this command if you need to enable NetFlow on another interface.</p>
Step 13	<p>Repeat Steps 10 through 12 for the remaining interfaces that you disabled NetFlow on in Steps 3 through 5.</p>	<p>(Required for any other interfaces that you need to enable NetFlow on.) —</p>
Step 14	<p><code>end</code></p> <p>Example: <pre>Router(config-if)# end</pre></p>	<p>(Required) Exits the current configuration mode and returns to privileged EXEC mode.</p>

Configuration Examples for Configuring NetFlow and NetFlow Data Export

This section contains basic NetFlow configuration examples:

- [Configuring Egress NetFlow Accounting: Example, page 32](#)
- [Configuring NetFlow Subinterface Support: Example, page 32](#)
- [Configuring NetFlow Multiple Export Destinations: Example, page 32](#)
- [Configuring NetFlow Version 5 Data Export: Example, page 33](#)
- [Configuring NetFlow Version 1 Data Export: Example, page 33](#)

Configuring Egress NetFlow Accounting: Example

The following example shows how to configure Egress NetFlow Accounting as described in the [“Egress NetFlow Accounting Benefits: NetFlow Accounting Simplified”](#) section on page 17:

```
configure terminal
!
interface ethernet 0/0
 ip flow egress
!
```

Configuring NetFlow Subinterface Support: Example

The following examples show how to configure NetFlow Subinterface Support as described in the [“NetFlow Subinterface Support Benefits: Fine-Tuning Your Data Collection”](#) section on page 19:

- [NetFlow Subinterface Support for ingress \(received\) traffic on a subinterface, page 32](#)
- [NetFlow SubInterface Support for egress \(transmitted\) traffic on a subinterface, page 32](#)

NetFlow Subinterface Support for ingress (received) traffic on a subinterface

```
configure terminal
!
interface ethernet 0/0.1
 ip flow ingress
!
```

NetFlow SubInterface Support for egress (transmitted) traffic on a subinterface

```
configure terminal
!
interface ethernet 1/0.1
 ip flow egress
!
```



Note

NetFlow performs additional checks for the status of each subinterface that requires more CPU processing time and bandwidth. If you have several subinterfaces configured and you want to configure NetFlow data capture on all of them, we recommend that you configure NetFlow on the main interface instead of on the individual subinterfaces.

Configuring NetFlow Multiple Export Destinations: Example

The following example shows how to configure NetFlow Multiple Export Destinations as described in the [“NetFlow Multiple Export Destinations: Benefits”](#) section on page 19:

```
configure terminal
!
ip flow-export destination 10.10.10.10 9991
ip flow-export destination 172.16.10.2 9991
!
```

**Note**

You can configure a maximum of two export destinations for the main cache and for each aggregation cache.

Configuring NetFlow Version 5 Data Export: Example

The following example shows how to configure the NetFlow data export using the Version 5 export format with the peer AS information.

```
configure terminal
!
ip flow-export version 5 peer-as
ip flow-export destination 172.16.10.2 99
exit

Router# show ip flow export
Flow export v5 is enabled for main cache
  Exporting flows to 172.16.10.2 (99)
  Exporting using source IP address 172.16.6.1
  Version 5 flow records, peer-as
  0 flows exported in 0 udp datagrams
  0 flows failed due to lack of export packet
  0 export packets were sent up to process level
  0 export packets were dropped due to no fib
  0 export packets were dropped due to adjacency issues
  0 export packets were dropped due to fragmentation failures
  0 export packets were dropped due to encapsulation fixup failures
Router#
```

Configuring NetFlow Version 1 Data Export: Example

The following example shows how to configure the NetFlow data export using the Version 1 export format with the peer AS information.

```
configure terminal
!
ip flow-export destination 172.16.10.2 99
exit

Router# show ip flow export
Flow export v1 is enabled for main cache
  Exporting flows to 172.16.10.2 (99)
  Exporting using source IP address 172.16.6.1
  Version 1 flow records
  0 flows exported in 0 udp datagrams
  0 flows failed due to lack of export packet
  0 export packets were sent up to process level
  0 export packets were dropped due to no fib
  0 export packets were dropped due to adjacency issues
  0 export packets were dropped due to fragmentation failures
  0 export packets were dropped due to encapsulation fixup failures
Router#
```

**Note**

No AS number or BGP next-hop information is exported with the Version 1 export format.

Additional References

The following sections provide references related to the configuring of NetFlow to capture and export netflow traffic data.

Related Documents

Related Topic	Document Title
Overview of Cisco IOS NetFlow	“Cisco IOS NetFlow Overview”
List of the features documented in the <i>Cisco IOS NetFlow Configuration Guide</i> configuration guide	“Cisco IOS NetFlow Features Roadmap”
The minimum information about and tasks required for configuring NetFlow and NetFlow Data Export	“Getting Started with Configuring NetFlow and NetFlow Data Export”
Tasks for configuring Configuring MPLS Aware NetFlow	Configuring MPLS Aware NetFlow
Tasks for configuring MPLS egress NetFlow accounting	Configuring MPLS Egress NetFlow Accounting and Analysis
Tasks for configuring NetFlow input filters	“Using NetFlow Filtering or Sampling to Select the Network Traffic to Track”
Tasks for configuring Random Sampled NetFlow	“Using NetFlow Filtering or Sampling to Select the Network Traffic to Track”
Tasks for configuring NetFlow aggregation caches	“Configuring NetFlow Aggregation Caches”
Tasks for configuring NetFlow BGP next hop support	“Configuring NetFlow BGP Next Hop Support for Accounting and Analysis”
Tasks for configuring NetFlow multicast support	“Configuring NetFlow Multicast Accounting”
Tasks for detecting and analyzing network threats with NetFlow	Detecting and Analyzing Network Threats With NetFlow
Tasks for configuring NetFlow Reliable Export With SCTP	NetFlow Reliable Export With SCTP
Tasks for configuring NetFlow Layer 2 and Security Monitoring Exports	“NetFlow Layer 2 and Security Monitoring Exports”
Tasks for configuring the SNMP NetFlow MIB	“Configuring SNMP and using the NetFlow MIB to Monitor NetFlow Data”
Tasks for configuring the NetFlow MIB and Top Talkers feature	“Configuring NetFlow Top Talkers using Cisco IOS CLI Commands or SNMP Commands”
Information for installing, starting, and configuring the CNS NetFlow Collection Engine	“Cisco CNS NetFlow Collection Engine Documentation”

Standards

Standards	Title
No new or modified standards are supported by this feature, and support for existing standards has not been modified by this feature.	—

MIBs

MIBs	MIBs Link
No new or modified MIBs are supported by this feature, and support for existing MIBs has not been modified by this feature.	To locate and download MIBs for selected platforms, Cisco IOS releases, and feature sets, use Cisco MIB Locator found at the following URL: http://www.cisco.com/go/mibs

RFCs

RFCs	Title
No new or modified RFCs are supported by this feature, and support for existing RFCs has not been modified by this feature.	—

Technical Assistance

Description	Link
The Cisco Technical Support website contains thousands of pages of searchable technical content, including links to products, technologies, solutions, technical tips, and tools. Registered Cisco.com users can log in from this page to access even more content.	http://www.cisco.com/techsupport

Glossary

AS—autonomous system. A collection of networks under a common administration sharing a common routing strategy. Autonomous systems are subdivided by areas. An autonomous system must be assigned a unique 16-bit number by the Internet Assigned Numbers Authority (IANA).

CEF—Cisco Express Forwarding. Layer 3 IP switching technology that optimizes network performance and scalability for networks with large and dynamic traffic patterns.

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

BGP next hop—IP address of the next hop to be used by a router to reach a certain destination.

dCEF—distributed Cisco Express Forwarding. A type of CEF switching in which line cards (such as Versatile Interface Processor (VIP) line cards) maintain identical copies of the forwarding information base (FIB) and adjacency tables. The line cards perform the express forwarding between port adapters; this relieves the Route Switch Processor of involvement in the switching operation.

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

fast switching—Cisco feature in which a route cache is used to expedite packet switching through a router.

flow—A set of packets with the same source IP address, destination IP address, protocol, source/destination ports, and type-of-service, and the same interface on which the flow is monitored. Ingress flows are associated with the input interface, and egress flows are associated with the output interface.

MPLS—Multiprotocol Label Switching. An emerging industry standard for the forwarding of packets along a normally routed path (sometimes called MPLS hop-by-hop forwarding).

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

NetFlow Aggregation—A NetFlow feature that lets you summarize NetFlow export data on an IOS router before the data is exported to a NetFlow data collection system such as the NetFlow Collection Engine. This feature lowers bandwidth requirements for NetFlow export data and reduces platform requirements for NetFlow data collection devices.

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

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

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

Feature Information for Configuring NetFlow and NetFlow Data Export

Table 10 lists the features in this module and provides links to specific configuration information. Only features that were introduced or modified in Cisco IOS Release 12.2(1) or 12.0(3)S or a later release appear in the table.

Not all commands may be available in your Cisco IOS software release. For details on when support for a specific command was introduced, see the command reference documentation.

For information on a feature in this technology that is not documented here, see the “Cisco IOS NetFlow Features Roadmap” module.

Cisco IOS software images are specific to a Cisco IOS software release, a feature set, and a platform. Use Cisco Feature Navigator to find information about platform support and Cisco IOS software image support. Access Cisco Feature Navigator at <http://www.cisco.com/go/fn>. You must have an account on Cisco.com. If you do not have an account or have forgotten your username or password, click **Cancel** at the login dialog box and follow the instructions that appear.



Note

Table 10 lists only the Cisco IOS software release that introduced support for a given feature in a given Cisco IOS software release train. Unless noted otherwise, subsequent releases of that Cisco IOS software release train also support that feature.

Table 10 Feature Information for Configuring NetFlow and NetFlow Data Export

Feature Name	Releases	Feature Configuration Information
Egress NetFlow Accounting	12.3(11)T Cisco IOS XE Release 2.1	<p>The Egress NetFlow Accounting feature allows NetFlow statistics to be gathered on egress traffic that is exiting the router. Previous versions of NetFlow allow statistics to be gathered only on ingress traffic that is entering the router.</p> <p>In Cisco IOS XE Release 2.1, this feature was introduced on Cisco ASR 1000 Series Routers.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • Egress NetFlow Accounting Benefits: NetFlow Accounting Simplified • Configuring Egress NetFlow Accounting: Example <p>The following commands were introduced by this feature: ip flow egress and ip flow-egress input-interface.</p> <p>The following commands were modified by this feature: flow-sampler, match, show ip cache flow, show ip cache verbose flow, and show ip flow interface.</p>
NetFlow Subinterface Support	12.2(14)S, 12.0(22)S, 12.2(15)T 12.2(33)SB Cisco IOS XE Release 2.1	<p>The NetFlow Subinterface Support feature provides the ability to enable NetFlow on a per-subinterface basis.</p> <p>In Cisco IOS XE Release 2.1, this feature was introduced on Cisco ASR 1000 Series Routers.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • NetFlow Subinterface Support Benefits: Fine-Tuning Your Data Collection • Configuring NetFlow Subinterface Support: Example <p>The following command was introduced by this feature: ip flow ingress.</p> <p>The following command was modified by this feature: show ip interface.</p>

Table 10 Feature Information for Configuring NetFlow and NetFlow Data Export (continued)

Feature Name	Releases	Feature Configuration Information
NetFlow Multiple Export Destinations:	12.0(19)S, 12.2(2)T, 12.2(14)S Cisco IOS XE Release 2.1	<p>The NetFlow Multiple Export Destinations feature enables configuration of multiple destinations of the NetFlow data.</p> <p>In Cisco IOS XE Release 2.1, this feature was introduced on Cisco ASR 1000 Series Routers.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • NetFlow Multiple Export Destinations: Benefits • Configuring NetFlow Multiple Export Destinations: Example <p>The following commands were modified by this feature: ip flow-aggregation cache, ip flow-export destination, and show ip flow export.</p>
NetFlow v9 Export Format	12.0(24)S, 12.3(1), 12.2(18)S, 12.2(27)SBC, 12.2(18)SXF Cisco IOS XE Release 2.1	<p>The NetFlow v9 Export Format is flexible and extensible, which provides the versatility needed to support new fields and record types. This format accommodates new NetFlow-supported technologies such as Multicast, MPLS, NAT, and BGP next hop.</p> <p>In Cisco IOS XE Release 2.1, this feature was introduced on Cisco ASR 1000 Series Routers.</p> <p>The following sections provide information about this feature:</p> <ul style="list-style-type: none"> • NetFlow Export Format Versions 9, 8, 5, and 1 • Configuring NetFlow Data Export Using the Version 9 Export Format <p>The following commands were modified by this feature: debug ip flow export, export, ip flow-export, and show ip flow export.</p>
Support for interface names added to NetFlow data export ¹	12.4(2)T	<p>The interface-names keyword for the ip flow-export command configures NetFlow data export to include the interface names from the flows when it exports the NetFlow cache entry to a destination system.</p>

1. This is a minor enhancement. Minor enhancements are not typically listed in Feature Navigator.

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