CHAPTER 5

Customizing FlowCollector

This chapter describes how to customize FlowCollector operations using thread, filter, and protocol definitions, lists of port and autonomous system numbers, and other FlowCollector configuration parameters.

This chapter includes the following sections:

Before You Begin: FlowCollector Configuration and Resource Files

The process of customizing FlowCollector operation involves changes and additions to one or more of the following FlowCollector configuration and resource files located in the **$NFC_DIR/config** directory:

- **nfconfig.file**
- **nfknown.protocols**
- **nfknown.srcports**
- **nfknown.dstports**
- **nfknown.srcasns**

- **nfknown.dstasns**
- **nf.resources**
- **nfcd.config**

Note You can use a text editor to change any of these files.

You can also use the interactive features of the NFUI to add, modify, or delete thread definitions (**nfconfig.file** file) and add or delete filter definitions (**nfconfig.file** file) or protocol definitions (**nfknown.protocols** file). For details on the use of the NFUI, see Chapter 3, "Using the FlowCollector User Interface," for more information.

nfconfig.file

The **nfconfig.file** contains definitions of the aggregation tasks that collect and aggregate data exported from NetFlow export devices in your network. These aggregation tasks, defined in terms of threads and filters, tell FlowCollector how to collect and aggregate the incoming NetFlow export data. Each aggregation task must have a thread defined for it (filters are optional).

For more information about creating or modifying threads and filters, see the "Understanding FlowCollector Data Collection and Aggregation" section on page 5-4.

nfknown.protocols

The **nfknown.protocols** file contains definitions of recognized application layer protocols (FTP, Telnet, and so forth) for use in aggregating data. These definitions are also used for protocol filters. You edit this file to add or remove protocol definitions. FlowCollector scans this file and maintains a list of protocols it finds. FlowCollector searches the protocols in the order that they are defined in the **nfknown.protocols** file.

Note To increase FlowCollector performance, put the most often used protocols at the beginning of the file.

For more information about creating or modifying protocols, see the "Defining Protocols" section on page 5-24.

nfknown.srcports

The **nfknown.srcports** file contains transport layer source TCP or UDP port numbers used in the **SourcePort** aggregation scheme (or any other aggregation scheme using source port numbers as part of its key). These TCP or UDP port numbers correspond to the port numbers defined in RFC 1700; for example, Telnet = 23, and FTP = 20 or 21.

Flow records having source ports that match defined values in the **nfknown.srcports** file are aggregated together. Flow records from source ports not defined in this file are aggregated under "Others."

For more information about creating or modifying source port numbers, see the "Defining Source and Destination Port Numbers" section on page 5-27.

nfknown.dstports

The **nfknown.dstports** file contains destination port numbers used in any aggregation scheme that includes destination port numbers as part of its key.

Flow records having destination ports that match defined values in the **nfknown.dstports** file are aggregated together. Flow records from destination ports not defined in this file are aggregated under "Others."

For more information about creating or modifying destination port numbers, see the "Defining Source and Destination Port Numbers" section on page 5-27.

nfknown.srcasns

The **nfknown.srcasns** file contains source autonomous system numbers, either origin or peer, used in any aggregation scheme that includes source autonomous system numbers as part of its key.

Flow records having source autonomous system numbers that match defined values in the **nfknown.srcasns** file are aggregated together. Flow records from source autonomous system numbers not defined in this file are aggregated under "Others."

For more information about creating or modifying source autonomous system numbers, see"Defining Source and Destination Autonomous System Numbers" section on page 5-29.

nfknown.dstasns

The **nfknown.dstasns** file contains destination autonomous system numbers, either origin or peer, used in any aggregation scheme that includes destination autonomous system numbers as part of its key.

Flow records having destination autonomous system numbers that match defined values in the **nfknown.dstasns** file are aggregated together. Flow records from destination autonomous system numbers not defined in this file are aggregated under "Others."

For more information about creating or modifying destination autonomous system numbers, see"Defining Source and Destination Autonomous System Numbers" section on page 5-29.

nf.resources

The **nf.resources** file contains the variables and corresponding directory file path names used to configure your startup FlowCollector environment. Besides the path names, the **nf.resources** file also includes a number of configuration parameters for tuning FlowCollector performance and behavior.

For more information about this file, see "Modifying FlowCollector Resources" section on page 5-30.

nfcd.config

The **nfcd.config** file contains the parameters needed by FlowCollector to automatically start NFCollector and NFCGW upon system startup, automatically restart NFCollector and NFCGW if they terminate abnormally, and set the scheduling priorities of NFCollector and NFCGW.

For more information, see "Configuring the Daemon (NFCD)" section on page 5-38.

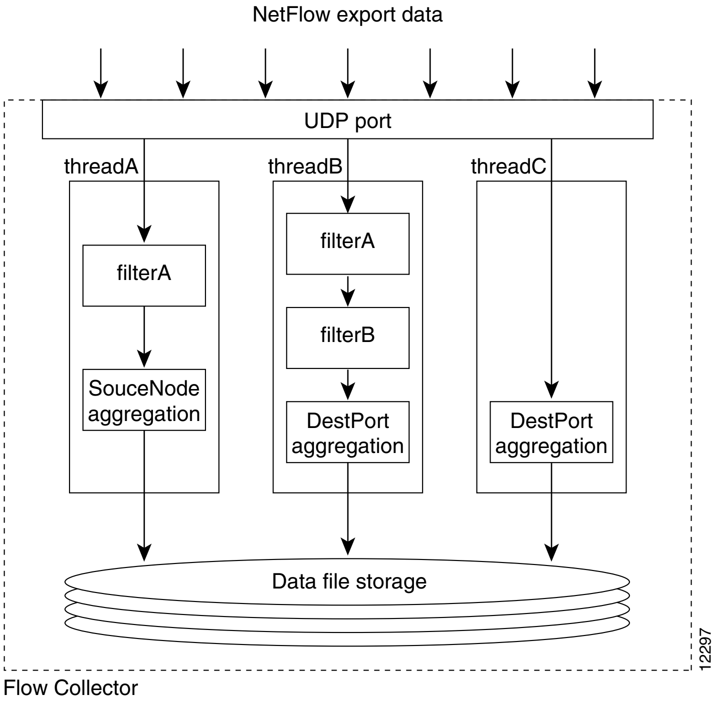
Understanding FlowCollector Data Collection and Aggregation

FlowCollector collects and summarizes (aggregates) data into data files based on user-defined criteria specified in a FlowCollector thread. A thread is an aggregation task defined by a set of user-configurable attributes that specify how FlowCollector aggregates the traffic flows stored on the workstation. Two key thread attributes are:

- Aggregation schemes—define how to aggregate the traffic flows stored on the workstation
- Filters—define the flow information that is accepted or rejected by the aggregation scheme.

Figure 5-1 shows an example of how FlowCollector uses threads and filters. In this example, threadA uses filterA and the **SourceNode** aggregation scheme; threadB uses both filterA and filterB (filters can be shared among threads) and the **DestPort** aggregation scheme; threadC does not use any filters, but it also uses the **DestPort** aggregation scheme.

Figure 5-1 NetFlow FlowCollector Data Aggregation Example



The following **nfconfig.file** file example contains the thread definitions to accomplish the general data aggregation scheme shown in Figure 5-1. The file contains two filter definitions (filterA and filterB) and three thread definitions (threadA, threadB, and threadC) to accomplish the aggregation. NetFlow export traffic arrives on FlowCollector UDP port 9991. Data is to be aggregated by the following aggregation schemes:

- **SourceNode** (source IP address)
- **DestPort** (destination port number).

```
Filter filterA
       permit     nexthop    172.16.23.65        0.0.0.0

Filter filterB
       deny       srcaddr    172.16.0.0          0.0.255.255
       permit     srcaddr    0.0.0.0             0.0.0.0

Thread threadA
       Filter filterA
       Aggregation SourceNode
       Period 10
       Port 9991
       State Active
       DataSetPath /opt/CSCOnfc/Data
       Compression No
       Binary No
       MaxUsage 500

Thread threadB
       Filter filterA
       Filter filterB
       Aggregation DestPort
       Period 10
       Port 9991
       State Active
       DataSetPath /opt/CSCOnfc/Data
       Compression No
       Binary No
       MaxUsage 500

Thread threadC
       Aggregation DestPort
       Period 10
       Port 9991
       State Active
       DataSetPath /opt/CSCOnfc/Data
       Compression No
       Binary No
       MaxUsage 500
```

In the example, threadA uses filterA to include only the traffic passing through the export device 172.16.23.65, whereas threadB uses both filters-filterA to include only the traffic passing through the export device 172.16.23.65, and filterB to exclude traffic from network 172.16.0.0. All three threads flush their aggregated data every 10 minutes into data files saved in the **/opt/CSCOnfc/Data** directory.

Creating a Filter

A filter defines which flow data is to be included or excluded as FlowCollector aggregates data. The default condition for a filter is to deny (exclude) the flow.

The syntax for a filter definition is as follows:

```
filter filter-name
       {permit|deny} type value mask
                  .
                  .
                  .
       {permit|deny} type value mask
```

where:

Filter	Keyword that identifies the definition as a filter.
filter-name	The unique, user-specified name of the filter. The name can be up to 16 alphanumeric characters.
permit	The keyword that keeps the data that matches the specified filter type and value.
deny	The keyword that rejects the data that matches the specified filter type and value (matching flow data is ignored and not aggregated).
type	The filter type. See Table 5-1 for a description of filter types.
value	The value associated with the filter type. All filter types require a value. See Table 5-1 for a description of filter types and values.
mask	Required if the filter uses the srcaddr, dstaddr, or nexthop type. The IP netmask that qualifies the IP address used as value. See Table 5-1 for a description.

Filter keyword and variable entries are not case sensitive. Figure 5-1 describes the default filter types provided with FlowCollector, the type of input required for the value, and whether the value requires a mask.

Table 5-1 Filter Types, Values, and Their Descriptions

Type	Value	Mask Required	Description
srcaddr	Source IP address	Yes	Filter the input data based on the source IP address. If you use this type, you must provide the IP netmask that qualifies the source IP address.
dstaddr	Destination IP address	Yes	Filter the input data based on the destination IP address. If you use this type, you must provide the IP netmask that qualifies the destination IP address.
srcport	Source port number	No	Filter the input data based on the source port number.
dstport	Destination port number	No	Filter the input data based on the destination port number.
srcinterface	Source interface number	No	Filter the input data based on the source interface number.
dstinterface	Destination interface number	No	Filter the input data based on the destination interface number.
nexthop	Next hop IP address	Yes	Filter the input data based on the next hop IP address. If you use this type, you must provide the IP netmask that qualifies the next hop IP address.

Table 5-1 Filter Types, Values, and Their Descriptions (continued)

Type	Value	Mask Required	Description
protocol	Protocol name	No	Filter the input data based on the protocol definitions in the **nfknown.protocols** file. For more information on protocol definitions, see Defining Protocols, page 5-24.
prot	Protocol number	No	Filter the input data based on the protocol number in the flow record, where the protocol number corresponds to a protocol specified in the **/etc/protocols** file of your workstation.
ToS	Type of service	No	Filter the input data based on the type of service (ToS).
srcas	Source AS	No	Filter the input data based on the autonomous system number of the source, either origin or peer.
dstas	Destination AS	No	Filter the input data based on the autonomous system number of the destination, either origin or peer.

When defining a filter, keep in mind the following qualifications:

- You must use an explicit permit statement to permit flows that do not meet defined filtering conditions; otherwise, everything in the flow is denied (the default condition for a filter is to deny the flow.) For example:

```
filter kill-www
       deny Dstport 80
```

  In this example, all flows going to port 80 and all other flows are denied. If you want to deny flows to port 80 only, but permit all other flows, you need an explicit wildcard entry to permit the other flows. For example:

```
filter kill-www
       deny      Dstport       80
       permit    Dstaddr       0.0.0.0          255.255.255.255
```

- When multiple filter conditions exist, FlowCollector attempts to apply the conditions sequentially, in the order you specify, until a match is found, as shown in the following example.

```
Filter filterA
       permit    Srcaddr       172.16.1.24      0.0.0.255
       deny      Srcaddr       192.168.0.0      0.0.255.255
       deny      Srcport       53
       permit    Dstaddr       0.0.0.0          255.255.255.255
```

If you want to permit traffic from network 172.16.1.0, but deny traffic coming from port 53, you should change the order of the filter conditions as follows:

```
Filter filterA
       deny      Srcaddr       192.168.0.0       0.0.255.255
       deny      Srcport       53
       permit    Srcaddr       172.16.1.24       0.0.0.255
       permit    Srcaddr       0.0.0.0           255.255.255.255
```

The last filter condition overrides the default behavior, which calls for denying all flows that do not match any of the first three filter conditions.

Creating a Thread

A thread is a set of defined attributes that tells FlowCollector how to aggregate the traffic flows stored on the workstation.

Note You can create up to 50 threads as required to meet your needs, but no more than 10 ports can be active at a time. Two threads can use the same UDP port do receive the NetFlow packets. Use the **State** attribute (described below) to make a thread active or inactive.

The syntax for a thread definition is as follows:

```
Thread thread-name
[Filter filter-name]
          .
          .
          .
[Filter filter-name]
Aggregation scheme
Period minutes
Port value
DataSetPath directory-path
State active|inactive
Compression yes|no
Binary yes|no
MaxUsage megabytes
```

Note The **MaxUsage** attribute must be the last attribute of a thread.

The keywords and their arguments are listed on separate lines for legibility. Keyword and argument entries are not case sensitive. Table 5-2 lists thread attributes and variables.

Table 5-2 Attributes and Variables for Creating a Thread

Attribute	Variable	Definition
Thread	*thread-name*	Unique, user-defined name of the thread. Can be up to 16 alphanumeric characters.
Filter	*filter-name*	(Optional.) Unique name of a previously defined filter. You can specify one or more filters in a thread definition. When more than one filter is specified in a thread, the result is a logical AND of the functions defined in the filters. Filters can be shared among threads. For more information on filters, see the previous section, "Creating a Filter" section on page 5-5.
Aggregation	*scheme*	A way to summarize data collected by FlowCollector. For more information about aggregation schemes, see the "Aggregation Schemes" section on page 5-11.
Period	*minutes*	The frequency, in minutes, for how often FlowCollector writes aggregated data from its memory buffers into a data file. Data received in each period is written into a separate file. For example, setting the period to 30 minutes generates two data files every hour.

Table 5-2 Attributes and Variables for Creating a Thread (continued)

Attribute	Variable	Definition
Port	*Value*	UDP port number on which FlowCollector is expecting NetFlow data from NetFlow export devices. The valid range of ports is between 1024 and 65535. In a default FlowCollector installation, UDP ports 9995 and 9996 are automatically configured as the UDP ports FlowCollector uses to receive NetFlow exported data. These numbers are defined in the default set of threads provided as part of the FlowCollector installation. You can define other UDP port numbers by selecting a number in the range 1024 to 65535 and using that number as the value in the Port attribute of an active thread definition.
DataSetPath	*directory-path*	Directory path used for storing the aggregated data (data files). If FlowCollector does not have write permission to the directory specified by a **DataSetPath** attribute in a thread definition, it uses **$NFC_DIR** as the root directory for the data files. For more details on data files, see Chapter 4, "Understanding the FlowCollector Data File Format," for more information.
State	active or inactive	The state of a thread. With an active thread, FlowCollector aggregates data according to the attributes defined for the thread and produces data files; when the thread is inactive, FlowCollector does not aggregate data according to the attributes defined for the thread and does not produce data files. You can have a maximum of 50 active threads at any time.
Compression	**yes** or **no**	Indicates whether the aggregation results generated by this thread should be compressed. When "no" is specified, no compression is performed. When "yes" is specified, compression is done at the level set by the **COMPRESSION_LEVEL** parameter in the **nf.resources** file. Refer to Table 5-6 for a detailed description of the **COMPRESSION_LEVEL** parameter. Data files are compressed using the **gzip** compression scheme. Compressed data files are identified with a **.gz** file extension. Compression is supported on all aggregation schemes and can be configured locally though the NFUI or remotely through the NetFlow Configuration and Control protocol. If you change this setting in an **NF_Thread** while it is collecting data, the modified **NF_Thread** flushes its existing buffer based on the existing **NF_Thread** attributes and it starts again. A **gunzip** utility (**nfc_gunzip**) is located in the **$NFC_DIR/tools** directory to unzip these data files.

Table 5-2 Attributes and Variables for Creating a Thread (continued)

Attribute	Variable	Definition
Binary	**yes** or **no**	Format of data files. Binary format data files are generated when this parameter is set to yes. When used in combination with the **Compression** parameter set to yes, small binary data files are generated that reduce the amount of disk space used by the data file and enhance system performance. Binary files that are generated without compression are identified with a **.bin** extension. Binary files that are generated with compression are identified with a **.bin.gz** extension. Binary data file creation is supported on all aggregation schemes (except **RawFlows**) and can be configured locally though the NFUI or remotely through the configuration and control protocol language documented in Appendix C, "FlowCollector Configuration and Control Protocol." If you change this setting in an **NF_Thread** while it is collecting data, the modified **NF_Thread** flushes its existing buffer based on the existing **NF_Thread** attributes and starts again. A conversion utility (**nfc_bin_to_ascii**) is located in the **$NFC_DIR/tools** directory to convert these data files to ASCII format if desired.
MaxUsage	*megabytes*	Maximum amount of disk space allocated to an **NF_Thread**, in megabytes. The default value is 0 which means no disk usage limit is set for this **NF_Thread**. Note, if an **NF_Thread** uses all of the specified disk space, older data files generated by the same **NF_Thread** are deleted. This reclaims disk space, allowing the new **NF_Thread** to be written to disk. This option does not function if you are operating in FlowCollector 2.0-compatible mode. See "Understanding Installation Modes" section on page 2-2 and the "Modifying FlowCollector Resources" section on page 5-30 for details on FlowCollector 2.0-compatible mode and for other options that affect disk space management.

Note If you are operating in FlowCollector 2.0-compatible mode, you should not define two active threads that use the same aggregation scheme and **DataSetPath**. Doing this causes FlowCollector to produce an unusable data file. See "Understanding Installation Modes" section on page 2-2 and the "Modifying FlowCollector Resources" section on page 5-30 for details on FlowCollector 2.0-compatible mode.

In the following example, thread Alpha uses the **SourceNode** aggregation scheme. FlowCollector creates a compressed binary data file in the directory **/opt/CSCOnfc/Data** every 30 minutes, keeps the last 24 data files per day, and specifies 500 MB in maximum disk space usage:

```
Thread Alpha
        Aggregation SourceNode
        Period 30
        Port 9991
        State Active
        DataSetPath /opt/CSCOnfc/Data
        Compression No
        Binary yes
        MaxUsage 500
```

Aggregation Schemes

FlowCollector provides a library of predefined aggregation schemes (see Table 5-3) that you can use to determine the type of information that is aggregated and stored in the data files.

Note You can specify only one aggregation scheme per thread.

Each aggregation scheme consists of one or more key fields, which tell FlowCollector what to look for in the exported NetFlow datagram, and one or more value fields, which contain statistical information pulled from the exported NetFlow datagram. The key fields and value fields shown in Table 5-3 correspond to the fields found in Version 1, Version 5, Version 7, and Version 8 NetFlow export datagrams. Table 5-3 provides brief definitions of each key and value field. For more information about these three versions of the NetFlow export datagram format, see NetFlow Export Datagram Formats

For example, the **SourceNode** aggregation scheme uses just one key field, srcaddr (source address), and returns data for three value fields: the total number of packets sent, the total number of bytes sent, and the total number of flows aggregated into this record. Other aggregation schemes offer different combinations of key and value fields (see Table 5-3) and are described individually below.

Table 5-3 FlowCollector Aggregation Schemes, Key Fields, and Value Fields

	Key Fields																Value Fields					
Aggregation Scheme	srcaddr	dstaddr	srcport	dstport	protocol	protocol byte (prot)	ToS	Input Interface	Output Interface	nexthop	src_as	dst_as	masked srcaddr	masked dstaddr	src_mask	dst_mask	packet count	byte count	flow count	firstTimeStamp	lastTimeStamp	totalActiveTime
RawFlows																						
SourceNode	X																X	X	X			
DestNode		X															X	X	X			
HostMatrix	X	X															X	X	X			
SourcePort			X														X	X	X			
DestPort				X													X	X	X			
Protocol					X												X	X	X			
DetailDestNode		X	X	X	X												X	X	X			
DetailHostMatrix	X	X	X	X	X												X	X	X	X	X	
DetailInterface	X	X						X	X	X							X	X	X			
CallRecord	X	X	X	X		X	X	X									X	X	X	X	X	X
ASPort			X	X	X						X	X					X	X	X			
ASMatrix[1]											X	X					X	X	X			
NetMatrix								X	X				X	X	X	X	X	X	X			

Table 5-3 FlowCollector Aggregation Schemes, Key Fields, and Value Fields (continued)

	Key Fields																Value Fields					
Aggregation Scheme	srcaddr	dstaddr	srcport	dstport	protocol	protocol byte (prot)	ToS	Input Interface	Output Interface	nexthop	src_as	dst_as	masked srcaddr	masked dstaddr	src_mask	dst_mask	packet count	byte count	flow count	firstTimeStamp	lastTimeStamp	totalActiveTime
DetailSourceNode	X		X	X	X												X	X	X			
DetailASMatrix[1]	X	X	X	X	X			X	X		X	X					X	X	X			
RouterAS								X	X		X	X					X	X	X	X	X	X
RouterProtoPort[2]			X	X		X											X	X	X	X	X	X
RouterSrcPrefix[2]								X			X		X		X		X	X	X	X	X	X
RouterDstPrefix[2]									X			X		X		X	X	X	X	X	X	X
RouterPrefix[2]								X	X		X	X	X	X	X	X	X	X	X	X	X	X
AsHostMatrix[1]	X	X									X	X					X	X	X	X	lX	X
HostMatrixInterface	X	X			X			X	X								X	X	X			
DetailCallRecord	X	X	X	X	X		X	X	X								X	X	X	X	X	X
RouterTosAS[2]							X	X	X		X	X					X	X	X	X	X	X
RouterTosProtoPort[2]			X	X		X	X	X	X								X	X	X	X	X	X
RouterTosSrcPrefix[2]							X	X			X		X		X		X	X	X	X	X	X
RouterTosDstPrefix[2]							X		X			X		X		X	X	X	X	X	X	X
RouterTosPrefix[2]							X	X	X								X	X	X	X	X	X
RouterPrePortProtocol[2]			X	X		X	X	X	X								X	X	X	X	X	X
RouterDestOnly[2,3]		X															X	X	X	X	X	X
RouterSrcDst[2,3]	X	X															X	X	X	X	X	X
RouterFullFlow[2,3]	X	X	X	X		X											X	lX	X	X	X	X
InterfaceMatrix	X	X					X	X									X	X	X			

[1] Compatible only with Version 5 and Version 7 export data.

[2] Compatible only with Version 8 export data. On-router aggregation is required. Only RawFlows or the same aggregation scheme on the FlowCollector stations and the reroute being monitored is supported.

[3] Supported on Catalyst 6000 Series only.

Table 5-4 lists the key and value field definitions.

Table 5-4 Key and Value Field Definitions

Field	Description
srcaddr	Source IP address
dstaddr	Destination IP address
srcport	TCP/UDP source port number or equivalent
dstport	TCP/UDP destination port number or equivalent
protocol	Name or label assigned to a protocol definition in the nfknown.protocols file
protocol byte (prot)	IP protocol type (for example, TCP = 6; UDP = 17)
ToS	IP type of service
input interface	SNMP index of input interface
output interface	SNMP index of output interface
nexthop	IP address of next hop export device
src_as	Autonomous system number of the source, either origin or peer
dst_as	Autonomous system number of the destination, either origin or peer
masked srcaddr	Source IP address masked with the source netmask (src_mask)
masked dstaddr	Destination IP address masked with the destination netmask (dst_mask)
src_mask	Source IP address prefix mask bits
dst_mask	Destination IP address prefix mask bits
packet count	Packets counted as part of this record
byte count	Total number of Layer 3 bytes counted as part of this record
flow count	Total number of flows aggregated into this record
firstTimeStamp	Time, in UTC seconds, of the first packet summarized into this record
lastTimeStamp	Time, in UTC seconds, of the last packet summarized into this record
totalActiveTime	Sum of individual active time for all the flows summarized into the current record

RawFlows

The output of the **RawFlows** aggregation scheme is an exact image of the NetFlow export datagram without aggregation and is stored in binary data files of *n* minutes' worth of data as specified by the Period attribute in the thread definition.

Note You cannot use filters or the **MaxUsage** thread attribute with the **RawFlows** aggregation scheme.

SourceNode

The output of the **SourceNode** aggregation scheme consists of one record for each unique source IP address present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr
Value fields:	packet count, byte count, flow count

DestNode

The output of the **DestNode** aggregation scheme consists of one record for each unique destination IP address present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	dstaddr
Value fields:	packet count, byte count, flow count

HostMatrix

The output of the **HostMatrix** aggregation scheme consists of one record for each unique source and destination IP address pair present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr
Value fields:	packet count, byte count, flow count

SourcePort

The output of the **SourcePort** aggregation scheme consists of one record for each unique source port present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcport
Value fields:	packet count, byte count, flow count

Known source ports are defined in the **nfknown.srcports** file. Undefined source ports are aggregated as “Others” in the data file.

DestPort

The output of the **DestPort** aggregation scheme consists of one record for each unique destination port present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	dstport
Value fields:	packet count, byte count, flow count

Known destination ports are defined in the **nfknown.dstports** file. Undefined destination ports are aggregated as "Others" in the data file.

Protocol

The output of the **Protocol** aggregation scheme consists of one record for each unique protocol (as defined in the **nfknown.protocols** file) present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	protocol
Value fields:	packet count, byte count, flow count

Known protocols are defined in the **nfknown.protocols** file. Undefined protocols are aggregated as "Others" in the data file.

DetailDestNode

The output of the **DetailDestNode** aggregation scheme consists of one record for each unique combination of destination IP address, source port, destination port, and protocol present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	dstaddr, srcport, dstport, protocol
Value fields:	packet count, byte count, flow count

DetailHostMatrix

The output of the **DetailHostMatrix** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, source port, destination port, and protocol present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, srcport, dstport, protocol
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp

DetailInterface

The output of the **DetailInterface** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, input, output, and nexthop present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, input, output, nexthop
Value fields:	packet count, byte count, flow count

CallRecord

The output of the **CallRecord** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, source port, destination port, protocol byte (IP protocol type), and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, srcport, dstport, protocol byte, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

ASPort

The output of the **ASPort** aggregation scheme consists of one record for each source and destination port, protocol, and unique source and destination autonomous system number pair present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcport, dstport, protocol, src_as, dst_as
Value fields:	packet count, byte count, flow count

ASMatrix

The output of the **ASMatrix** aggregation scheme consists of one record for each unique source and destination autonomous system number pair present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	src_as, dst_as
Value fields:	packet count, byte count, flow count

Note The **ASMatrix** aggregation scheme is valid only when used with Version 5 or Version 7 export data. Version 7 is supported only by the Catalyst 5000 series switch with an NFFC.

NetMatrix

The output of the **NetMatrix** aggregation scheme consists of one record for each unique combination of input interface, output interface, masked source IP address, masked destination IP address, source mask, and destination mask present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	input interface, output interface, masked srcaddr, masked dstaddr, src_mask, dst_mask
Value fields:	packet count, byte count, flow count

Note The **NetMatrix** aggregation scheme is valid only when used with Version 5 or Version 7 export data. Version 7 is supported only by the Catalyst 5000 series switch with an NFFC.

DetailSourceNode

The output of the **DetailSourceNode** aggregation scheme consists of one record for each unique combination of source IP address, source port, destination port, and protocol present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, srcport, dstport, protocol
Value fields:	packet count, byte count, flow count

DetailASMatrix

The output of the **DetailASMatrix** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, source autonomous system number, destination autonomous system number, input interface, output interface, source port, destination port, and protocol present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, src_as, dst_as, input interface, output interface, srcport, dstport, protocol
Value fields:	packet count, byte count, flow count

Note The **DetailASMatrix** aggregation scheme is valid only when used with Version 5 or Version 7 export data. Version 7 is supported only by the Catalyst 5000 series switch with an NFFC.

RouterAS

The output of the **RouterAS** aggregation scheme consists of one record for each unique combination of input interface, output interface, source autonomous system number, and destination autonomous system number present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	input interface, output interface, src_as, dst_as
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

Note The **RouterAS** aggregation scheme is compatible only with Version 8 export data. On-router aggregation is required. Only **RawFlows** or the same aggregation scheme on the FlowCollector station and the router being monitored is supported. For example, if you are using **RouterAS** on the FlowCollector station, you must also use the **AS** aggregation scheme on the router being monitored.

RouterProtoPort

The output of the **RouterProtoPort** aggregation scheme consists of one record for each unique combination of source port, destination port, and protocol present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcport, dstport, protocol
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

Note The **RouterProtoPort** aggregation scheme is compatible only with Version 8 export data. On-router aggregation is required. Only **RawFlows** or the same aggregation scheme on the FlowCollector station and the router being monitored is supported. For example, if you are using **RouterProtoPort** on the FlowCollector station, you must also use the **ProtoPort** aggregation scheme on the router being monitored.

RouterSrcPrefix

The output of the **RouterSrcPrefix** aggregation scheme consists of one record for each unique combination of input interface, source autonomous system number, masked source IP address, and source mask present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	input interface, src_as, masked srcaddr, src_mask
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

Note The **RouterSrcPrefix** aggregation scheme is compatible only with Version 8 export data. On-router aggregation is required. Only **RawFlows** or the same aggregation scheme on the FlowCollector station and the router being monitored is supported. For example, if you are using **RouterSrcPrefix** on the FlowCollector station, you must also use the **SrcPrefix** aggregation scheme on the router being monitored.

RouterDstPrefix

The output of the **RouterDstPrefix** aggregation scheme consists of one record for each unique combination of output interface, destination autonomous system number, masked destination IP address, and destination mask present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	output interface, dst_as, masked dstaddr, dst_mask
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

Note The **RouterDstPrefix** aggregation scheme is compatible only with Version 8 export data. On-router aggregation is required. Only **RawFlows** or the same aggregation scheme on the FlowCollector station and the router being monitored is supported. For example, if you are using **RouterDstPrefix** on the FlowCollector station, you must also use the **DstPrefix** aggregation scheme on the router being monitored.

RouterPrefix

The output of the **RouterPrefix** aggregation scheme consists of one record for each unique combination of input interface, output interface, source autonomous system number, destination autonomous system number, masked source IP address, masked destination IP address, source mask, and destination mask present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	input interface, output interface, src_as, dst_as, masked srcaddr, masked dstaddr, src_mask, dst_mask
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

Note The **RouterPrefix** aggregation scheme is compatible only with Version 8 export data. On-router aggregation is required. Only **RawFlows** or the same aggregation scheme on the FlowCollector station and the router being monitored is supported. For example, if you are using **RouterPrefix** on the FlowCollector station, you must also use the **Prefix** aggregation scheme on the router being monitored.

ASHostMatrix

The output of the **ASHostMatrix** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, source autonomous system number, and destination autonomous system number present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, src_as, dst_as
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

Note The **ASHostMatrix** aggregation scheme is valid only when used with Version 5 or Version 7 export data. Version 7 is supported only by the Catalyst 5000 series switch with an NFFC.

HostMatrixInterface

The output of the **HostMatrixInterface** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, protocol, input interface, and output interface present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, protocol, input interface, output interface
Value fields:	packet count, byte count, flow count

DetailCallRecord

The output of the **DetailCallRecord** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, source port, destination port, input interface, output interface, protocol, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, srcport, dstport, input interface, output interface, protocol, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterTosAS

The output of the **RouterTosAS** aggregation scheme consists of one record for each unique combination of source autonomous system number, destination autonomous system number, input interface, output interface, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	src_as, dst_as, input interface, output interface, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterTosProtoPort

The output of the **RouterTosProtoPort** aggregation scheme consists of one record for each unique combination of source port, destination port, protocol byte (IP protocol type), input interface, output interface, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcport, dstport, protocol byte, input interface, output interface, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterTosSrcPrefix

The output of the **RouterTosSrcPrefix** aggregation scheme consists of one record for each unique combination of masked source IP address, source IP address prefix mask bits, input interface, autonomous system number of the source, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	masked srcaddr, src_mask, input interface, src_as, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterTosDstPrefix

The output of the **RouterTosDstPrefix** aggregation scheme consists of one record for each unique combination of masked destination IP address, destination IP address prefix mask bits, output interface, destination autonomous system number, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	masked dstaddr, dst_mask, output interface, dst_as, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterTosPrefix

The output of the **RouterTosPrefix** aggregation scheme consists of one record for each unique combination of masked source address, masked destination address, source IP address prefix mask bits, destination IP address prefix mask bits, input interface, output interface, source autonomous system number, destination autonomous system number, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	masked srcaddr, masked dstaddr, src_mask, dst_mask, input interface, output interface, src_as, dst_as, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterPrePortProtocol

The output of the **RouterPrePortProtocol** aggregation scheme consists of one record for each unique combination of source IP address masked with the source netmask, source IP address prefix mask bits, destination IP address masked with the destination netmask, destination IP address prefix mask bits, source port, destination port, protocol byte (IP protocol type), input interface, output interface, and type of service present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	masked srcaddr, src_mask, masked dstaddr, dst_mask, srcport, dstport, protocol byte, input interface, output interface, ToS
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterDestOnly

The output of the **RouterDestOnly** aggregation scheme consists of one record for each unique destination IP address present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	dstaddr
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterSrcDst

The output of the **RouterSrcDst** aggregation scheme consists of one record for each unique combination of source IP address and destination IP address present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

RouterFullFlow

The output of the **RouterFullFlow** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, source port, destination port, and protocol byte (IP protocol type) present in the flow data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, srcport, dstport, protocol byte
Value fields:	packet count, byte count, flow count, firstTimeStamp, lastTimeStamp, totalActiveTime

InterfaceMatrix

The output of the **InterfaceMatrix** aggregation scheme consists of one record for each unique combination of source IP address, destination IP address, input interface, and type of service present in the data received by FlowCollector during the current collection period. Each output record contains the following fields:

Key field:	srcaddr, dstaddr, input interface, ToS
Value fields:	packet count, byte count, flow count

Defining Protocols

Use the information in this section to define the protocols that you want FlowCollector to recognize as it aggregates data. The protocols FlowCollector recognizes are defined in the **nfknown.protocols** file, located in the **$NFC_DIR/config** directory.

Note The path name to the **nfknown.protocols** file is defined in the **nf.resources** file.

FlowCollector recognizes the protocol and aggregates traffic statistics associated with the protocol only when the following conditions are met:

- the protocol definition must be added to the **nfknown.protocols** file

- there must be an active thread calling for this protocol
- there must be NetFlow data traffic that applies to the protocol.

If you remove the protocol from the **nfknown.protocols** file, information for that protocol is no longer recognized and is aggregated under "Others."

Figure 5-2 shows an example of a typical communication session between Host A and Host B. This example assumes that NetFlow data export is enabled for the export device interfaces to both Host A and Host B so that exported NetFlow data gives FlowCollector statistics for communication in both directions (A to B; B to A). In this example, FlowCollector aggregates data for two protocols, Telnet and FTP, between Host A (the Telnet server, using port 23) and Host B (the Telnet client, using port 9001).

- For Telnet, FlowCollector aggregates data between Host A (the Telnet server, using port 23) and Host B (the Telnet client, using port 9001).
- For FTP, FlowCollector aggregates data between Host A (the FTP server, using port 20) and Host B (the FTP client, using port 9002).

Whether the aggregated data is stored in data files for later retrieval depends on how FlowCollector is customized.

Figure 5-2 Data Collection Example

Table 5-5 Data Received Example

Source Address	Destination Address	Source Port	Destination Port	Protocol Byte	Packets	Bytes
A	B	23	9001	6	20	2000
B	A	9001	23	6	30	1000
A	B	20	9002	6	20	200
B	A	9002	20	6	50	300

When you add the Telnet protocol definition to the **nfknown.protocols** file, the data file produced by the protocol aggregation scheme contains a row with 50 packets (20 plus 30) and 3000 bytes (2000 plus 1000).

In this example, no FTP protocol definition was added to the **nfknown.protocols** file, so the data file also has another row for "Others" (including the FTP data) containing 70 packets (20 plus 50) and 500 bytes (200 plus 300).

The protocols listed in the **nfknown.protocols** file are used by the aggregation schemes and protocol filters you define in the **nfconfig.file** file. To configure the protocols that FlowCollector recognizes, you must edit the **nfknown.protocols** file and add a definition that includes the following information:

- protocol name
- source or destination port
- protocol type.

The command syntax for a protocol definition is:

```
protocol name
       [[srcport|dstport] number [OR [srcport|dstport] number]]
         prot value
```

where:

Protocol	Keyword that identifies the definition as a protocol.
name	Unique, user-specified name of the protocol definition. Can be up to 16 alphanumeric characters.
srcport	Source port.
dstport	Destination port.
number	Port number.
OR	(Optional.) Provides a Boolean OR functionality when you have more than one **srcport** or **dstport**.
prot	Protocol byte.
value	IP protocol type (similar to those specified in the **/etc/protocols** file on a UNIX workstation; for example, TCP = 6, UDP = 17).

Note The **Protocol** keyword and variable entries are not case sensitive.

The known protocols (such as WWW, Telnet, and FTP) listed in the **nfknown.protocols** files are similar to the definitions specified in the **/etc/services** file of a UNIX workstation. For information about the protocols and protocol types supported on your workstation, refer to the protocols file in the **/etc** directory on your workstation.

The protocol definitions in the **nfknown.protocols** file cause FlowCollector to recognize the protocols originating from or terminating on the specified ports. For example, in the sample protocol list shown below, the first protocol definition uses the OR option to cause FlowCollector to recognize traffic flows for all Telnet sessions originating from or terminating on port 23.

```
Protocol TCP-Telnet
         Dstport 23 OR Srcport 23
         Prot 6

Protocol TCP-FTP
         Srcport 20 OR Srcport 21 OR Dstport 20 OR Dstport 21
         Prot 6

Protocol TCP-WWW
         Dstport 80 OR Srcport 80
         Prot 6

Protocol TCP-SMTP
         Srcport 25 OR Dstport 25
         Prot 6

Protocol TCP-Other
         Prot 6

Protocol UDP-TFTP
         Srcport 69 OR Dstport 69
         Prot 17
```

Defining Source and Destination Port Numbers

Use the information in this section to specify the source and destination port numbers from which FlowCollector collects and aggregates data. The port numbers FlowCollector recognizes are defined in the following files, located in the **$NFC_DIR/config** directory:

- **nfknown.srcports**—this file contains the source port numbers you want FlowCollector to recognize
- **nfknown.dstports**—this file contains the destination port numbers you want FlowCollector to recognize.

Note The path names to these files are defined in the **nf.resources** file.

FlowCollector uses the contents of the **nfknown.srcports** and **nfknown.dstports** files in any aggregation scheme that uses the **SourcePort** and **DestPort** fields. When you add a port definition to either of these files, traffic to or from the defined port is counted separately in the data file. Unrecognized ports (ports not defined in their respective files) are aggregated as “Others” in the data file.

Note The **nfknown.dstports** file uses the same format and syntax conventions as the **nfknown.srcports** file.

The command syntax for a port number, range of port numbers, or range grouped under an assigned label is:

```
value[,value[:label]]
          .
          .
          .
value[,value[:label]]
```

where:

value	A number between 0 and 65535.
label	(Optional.) An alphanumeric ASCII string of up to 16 characters.

A range of ports is defined by using a comma to separate two numbers (an optional space can be added for legibility). A range can span any set of ports up to the maximum number of ports available on the system (currently 65,535). The following example shows a range of ports:

```
50, 100
```

You can also define a range of source or destination ports to be treated as one logical port, and assign a label to represent that range of ports. The following example shows a range of ports to be treated as the logical port named 10K_19K_Pt_Rng.

```
10000, 19999: 10K_19K_Pt_Rng
```

In this case, traffic is aggregated and reported for the logical port 10K_19K_Pt_Rng, rather than for each of the individual port numbers in the range.

The following example shows the contents of a sample **nfknown.srcports** file:

```
21:ftp
88
50, 100
10000, 19999: 10K_19K_Pt_Rng
20000, 29999: My_Range
40000, 49999: My_Range
```

In the preceding example the meaning of the entries is as follows:

21:ftp	Indicates that a flow with a port number of 21 is aggregated under the label **ftp** in the data file.
88	Indicates that a flow with a port number of 88 is aggregated under the label **88** in the data file.
50, 100	Indicates that a flow with a port number in the range from 50 to 100 is aggregated under a label that is the same as its port number. For example, if a flow has the port number 75, the label of the flow in the data file is **75**. Flows within the range, but with different port numbers, are aggregated individually in the data file.
10000, 19999: 10K_19K_Port_Rng	Indicates that the port number of any port in the range is replaced by the label **10K_19K_Port_Rng**, and that flows within the range are aggregated together under the label **10K_19K_Port_Rng** in the data file.
20000, 29999: My_Range 40000, 49999: My_Range	Indicates that the port number of any port in the two ranges is replaced by the label **My_Range**, and that flows within the specified ranges are aggregated together under the label **My_Range** in the data file.

Defining Source and Destination Autonomous System Numbers

Use the information in this section to specify the source and destination autonomous systems from which FlowCollector collects and aggregates data. The autonomous systems FlowCollector recognizes are defined in the following files, located in the **$NFC_DIR/config** directory:

- **nfknown.srcasns**—this file contains the source autonomous system numbers, either origin or peer, that you want FlowCollector to recognize
- **fknown.dstasns**—this file contains the destination autonomous system numbers, either origin or peer, that you want FlowCollector to recognize.

Note The path names to these files are built into the **nf.resources** file. The filename is limited to 16 characters.

FlowCollector uses the contents of the **nfknown.srcasns** and **nfknown.dstasns** files in aggregation schemes that make use of source or destination autonomous system numbers. When you add an autonomous system definition to either of these files, traffic to or from the autonomous system is counted separately in the data file. Any unrecognized autonomous system numbers (autonomous system numbers not defined in their respective files) are aggregated together and appear as “Others” in the data file.

Note The the **nfknown.srcasns** and **nfknown.dstasns** files use the same format and syntax conventions as the **nfknown.srcports** file.

The following example shows the contents of an **nfknown.srcasns** file.

```
1: Your_Network
2
10, 15
20, 30: My_Network
35, 40: My_Network
```

In this example, the entry:

1: Your_Network	Indicates that a flow with an autonomous system number of 1 is aggregated under the label **Your_Network** in the data file.
2	Indicates that a flow with an autonomous system number of 2 is aggregated under the label **2** in the data file.
10, 15	Indicates that a flow with an autonomous system number in the range from 10 to 15 is aggregated under a label that is the same as its autonomous system number. For example, if a flow has the autonomous system number 13, the label of the flow in the data file is **13**. Flows within the range, but with different autonomous system numbers, are aggregated individually in the data file.
20, 30: My_Network 35, 40: My_Network	Indicates that the autonomous system number is replaced by the label **My_Network**, and that flows within the specified ranges are aggregated together in the data file under the label **My_Network** in the data file.

Modifying FlowCollector Resources

The **nf.resources** file contains the configuration parameter settings and directory file path names used to configure your startup FlowCollector environment. Besides the path name definitions, the **nf.resources** file also includes a set of parameters for tuning FlowCollector performance. Only users with root or **.bin** directory privileges can modify this file. The **nf.resources** file is located in the **$NFC_DIR/config** directory.

Table 5-6 describes the available configuration parameters and their values.

Table 5-6 nf.resources File Configuration Parameters

Flag	Possible Values	Description	Default Value
OUTPUT_DOTTEDADDRESS	Yes No	Writes the IP address to the data files in dotted decimal format, for example, 172.16.3.100. Writes the IP address to the data files in network address format, for example, 8557414940.	Yes
CSV_FORMAT	Yes No	Uses a comma (,) as the delimiter in writing aggregation output. Uses a vertical bar (|) as the delimiter.	No
LONG_OUTPUTFILE_SUFFIX	Yes No	Sets the output file extension to add the year, month, and day to the hour and minute, for example, _YYYY_MM_DD.HHMM. Sets the output file extension to include HHMM only.	No
NFC_POOLENTRIES	Varies according to configuration	Sets the dynamic buffer pool entry's size to enhance the performance of NFC buffering packets NetFlow FlowCollector data packets.	2000
NFC_POOLENTRIES_FOR_FLUSH	Varies according to configuration	Enhances the performance for NetFlow FlowCollector by buffering packets when NetFlow FlowCollector is flushing results to disk.	10000
GMT_FLAG	Yes No	Uses the Greenwich Mean Time reference to set date and time. Uses local time as set by system clock. This attribute affects the date and time used in naming the data file directory structure, names of data files, headers in data files, and messages in the log files.	Yes

Table 5-6 nf.resources File Configuration Parameters (continued)

Flag	Possible Values	Description	Default Value
DEVICE_DOTTEDADDRESS	Yes	Uses the IP address of the sending export device for storage.	Yes
	No	Attempts to get the DNS name before using the IP address of the sending export device for storage. If a **ROUTER_GROUPNAME** label has been defined using the **ROUTER_GROUPNAME** configuration parameter, that label is used; otherwise, the IP address or the DNS name is used, depending on the setting of the **DEVICE_DOTTEDADDRESS** configuration parameter. For more information on the **ROUTER_GROUPNAME** configuration parameter, see the "Mapping a List of IP Addresses to One IP Address or Label" section on page 5-36.	

Table 5-6 nf.resources File Configuration Parameters (continued)

Flag	Possible Values	Description	Default Value
SOURCENODE_BUCSIZE	Varies according to configuration	Controls performance. The term **BUCSIZE** refers to the number of buffer pages set aside to hold aggregated data for a given aggregation scheme. The general rule of thumb for **BUCSIZE** values is: if an aggregation scheme produces <*n*> records in a collection interval, the corresponding **BUCSIZE** value should be (approximately) between <*n*>/20 and <*n*>. The best approach is to sample NetFlow traffic, and then determine whether changes are required.	2000
DESTNODE_BUCSIZE			2000
HOSTMATRIX_BUCSIZE			2000
SOURCEPORT_BUCSIZE			2000
DESTPORT_BUCSIZE			2000
PROTOCOL_BUCSIZE			2000
DETAILSOURCENODE_BUCSIZE			2000
DETAILDESTNODE_BUCSIZE			2000
DETAILHOSTMATRIX_BUCSIZE			6000
DETAILINTERFACE_BUCSIZE			6000
CALLRECORD_BUCSIZE			50000
ASMATRIX_BUCSIZE			25000
NETMATRIX_BUCSIZE			25000
DETAILASMATRIX_BUCSIZE			50000
ASHOSTMATRIX_BUCSIZE			50000
HOSTMATRIXINTERFACE_BUCSIZE			50000
DETAILCALLRECORD_BUCSIZE			50000
ROUTERAS_BUCSIZE			50000
ROUTERTOSAS_BUCSIZE			50000
ROUTERPROTOPROT_BUCSIZE			50000
ROUTERTOSPROTOPROT_BUCSIZE			50000
ROUTERSOURCEPREFIX_BUCSIZE			50000
ROUTERTOSSOURCEPREFIX_BUCSIZE			50000
ROUTERDESTPREFIX_BUCSIZE			50000
ROUTERTOSDESTPREFIX_BUCSIZE			50000
ROUTERPREFIX_BUCSIZE			50000
ROUTERTOSPREFIX_BUCSIZE			50000
ROUTERPREPORTPROTOCOL_BUCSIZE			50000
ROUTERDESTONLY_BUCSIZE			50000
ROUTERSRCDST_BUCSIZE			50000
ROUTERFULLFLOW_BUCSIZE			50000
INTERFACEMATRIX_BUCSIZE			50000
SOCKET_BUFSIZE	Buffer size (in bytes)	Specifies the size of the UDP socket receive buffer.	900000

Table 5-6 nf.resources File Configuration Parameters (continued)

Flag	Possible Values	Description	Default Value
ROUTER_GROUPNAME	List of IP addresses or labels	Allows a user-specified IP address or label to be substituted for a list of IP addresses from which FlowCollector can receive NetFlow export datagrams. For more information, see the "Mapping a List of IP Addresses to One IP Address or Label" section on page 5-36.	Disabled
ACCEPT_PACKETS_FROM	List of IP addresses or labels	Allows packets to be filtered by source address (or by defined **ROUTER_GROUPNAME** label). For more information, see the "Preventing FlowCollector from Accepting Unsolicited Packets" section on page 5-37.	Disabled
USE_SHORT_CUT_ADDRESS_AS_SOURCE_IP	Yes No	Uses the address of the router being bypassed (shortcut) as the source of the corresponding flow. Uses the address of the export device being bypassed (shortcut) as the source of the corresponding flow. For more information, see the "Retaining Router IP Addresses for Switched Export Packets" section on page 5-37.	No
USER_SCRIPT_LOCATION	Path name and filename	Specifies the location of a user-supplied script. For more information, see the "Using a User-Defined Script to Process FlowCollector Data Files" section on page 5-38.	Disabled
OUTPUT_BUFFER_SIZE	1, 2, 4, 8, 16	Specifies the size (in megabytes) of the memory buffer FlowCollector uses for I/O operations. For more information, see the "Changing the Output Buffer Size" section on page 5-38.	4

Table 5-6 nf.resources File Configuration Parameters (continued)

Flag	Possible Values	Description	Default Value
COMPRESSION_LEVEL	1 through 9	Value that determines different compression levels for data files. A value of 1 provides quicker access, while a value of 9 provides the maximum amount of compression. Data files are compressed using the **gzip** compression scheme. Compressed data files are identified with a **.gz** file extension. Compression is supported on all aggregation schemes and can be configured locally though the NFUI or remotely through the NetFlow Configuration and Control protocol. If you change this setting in an **NF_Thread** while it is collecting data, the modified **NF_Thread** flushes its existing buffer based on the existing **NF_Thread** attributes and it starts again. A **gunzip** utility (**nfc_gunzip**) is located in the **$NFC_DIR/tools** directory to unzip these data files.	6
NFC_USERNAME	User name	Specifies the registered FlowCollector user. Only **root** and this specified user can access or modify FlowCollector configuration items and statistics from a remote location.	**nfcuser**
CLEANUP_INTERVAL	Hours	Specifies the number of hours between each data file **CLEANUP_JOB**. Setting this parameter to zero disables this feature.	24 hours
CLEANUP_JOB	Path name and filename	Specifies the location of the script or program that is run at the end of the time period specified in the **CLEANUP_INTERVAL** parameter. This script could be the default shell script, a user-defined script, or a binary program file. The default shell script path and filename is **$NFC_DIR/bin/nfc_clean_up_job.sh**.	Shell script supplied by FlowCollector that deletes any files older than 7 days.

Table 5-6 nf.resources File Configuration Parameters (continued)

Flag	Possible Values	Description	Default Value
DISK_USAGE_THRESHOLD	Percentage	Specifies a disk usage threshold percentage level. Every time a data file is written to disk, information on disk space usage is obtained. If disk space usage exceeds the specified percentage value, one unsolicited event notification (UEN) is sent. Future UENs are sent only after disk space levels have fallen below the percentage amount specified in the **DISK_USAGE_CLEAR_THRESHOLD** value. Setting this parameter to zero disables this feature.	75%
DISK_USAGE_CLEAR_THRESHOLD	Percentage	An *all-clear* UEN is sent when disk usage falls below this threshold percentage value once a **DISK_USAGE_THRESHOLD** UEN has been sent.	75%
NFC20_COMPATIBLE _MODE	Yes	Instructs FlowCollector 3.0 to generate FlowCollector 2.0-compatible data files, **filesready** file, and directory structures. When this parameter is set to "**Yes**," the following FlowCollector 3.0 features are disabled: • Version 3.0 directory structure, including thread IDs • Version 3.0 **filesready** file • Aggregation definitions in data files • MaxUsage parameter available in an **NF_Thread**.	Yes
	No	FlowCollector 3.0-compatible files and directories are generated.	
UEN_RECIPIENT_LIST	IP Address, port or DNS name, port	Specifies a list of the IP addresses and ports (or DNS system names and ports) of the client programs running to receive unsolicited event notifications (UENs). For example, an entry "flow-ultra1, 12345" implies that a program executing on flow-ultra1 and listening to port 12345 would receive UENs dispatched by the NFCGW.	None

Increasing UDP Socket Receive Buffer Size

Because of the high volume of NetFlow data export traffic, you might have to increase the normal buffer size associated with the UDP socket on which data is received. To do so, edit the value (in bytes) of the **SOCKET_BUFSIZE** parameter in the **$NFC_DIR/config/nf.resources** file.

Mapping a List of IP Addresses to One IP Address or Label

You can substitute a user-specified IP address or label for a set of IP addresses from which FlowCollector receives NetFlow export datagrams. For example, you can specify the label "blab-gateway" as the label representing packets coming from three separate IP addresses: 172.16.1.172, 172.16.1.173, and 192.68.1.25.

To do this, you must edit the **ROUTER_GROUPNAME** parameter in the **nf.resources** file. The syntax is:

```
ROUTER_GROUPNAME label {
     a.b.c.d
        .
        .
        .
     w.x.y.z
}
```

where *label* is either an IP address or an ASCII word. Each of the IP addresses in the body of the **ROUTER_GROUPNAME** block must be on a separate line. An example of a **ROUTER_GROUPNAME** definition follows:

```
ROUTER_GROUPNAME blab-gateway {
     172.16.1.172
     172.16.1.173
     192.68.1.25
}
```

If applicable, the mapped **ROUTER_GROUPNAME** parameter is used with all aggregation schemes, but FlowCollector uses the real IP address to report errors involving receipt of an invalid or unsolicited NetFlow export packet.

Preventing FlowCollector from Accepting Unsolicited Packets

In its default configuration, FlowCollector accepts NetFlow export packets from any IP address. If necessary, you can specify the source IP addresses or defined **ROUTER_GROUPNAME** labels from which FlowCollector should receive NetFlow export packets, thus preventing FlowCollector from accepting packets from any unspecified sources.

To do this, you must remove the comment character from the beginning of each line in the **ACCEPT_PACKETS_FROM** parameter in the **nf.resources** file and edit the parameter to include the source IP addresses or **ROUTER_GROUPNAME** labels. The syntax of the parameter is:

```
ACCEPT_PACKETS_FROM {
     a.b.c.d
        .
        .
        .
     w.x.y.z
}
```

where each of the IP addresses (or **ROUTER_GROUPNAME** labels) defined in the body of the **ACCEPT_PACKETS_FROM** block must be on a separate line. An example of a **ACCEPT_PACKETS_FROM** definition follows:

```
ACCEPT_PACKETS_FROM {
     172.31.2.1
     172.31.2.2
     172.31.2.3
     blab_gateway
}
```

For information on **ROUTER_GROUPNAME** labels, see the "Mapping a List of IP Addresses to One IP Address or Label" section on page 5-36.

Note By default, FlowCollector accepts packets from all sources.

Retaining Router IP Addresses for Switched Export Packets

If your network includes switching devices that support Version 7 (Catalyst 5000 series switch with an NFFC) NetFlow export datagrams, you can configure FlowCollector to retain the IP address of the shortcut router as the source of data switched through a Cisco Catalyst 5000 series switch. To do this, you must edit the **USE_SHORT_CUT_ADDRESS_AS_SOURCE_IP** parameter in the **nf.resources** file. The syntax of the parameter is:

```
USE_SHORT_CUT_ADDRESS_AS_SOURCE_IP value
```

where *value* is either **yes** or **no**. The default setting is **no**. If you change the setting to **yes**, FlowCollector uses the IP address of the bypassed router as the source of the corresponding flow.

Note When the **USE_SHORT_CUT_ADDRESS_AS_SOURCE_IP** parameter is set to **yes**, FlowCollector is not able to show the missed records count in the header of the data files, because it is impossible to predict the IP address of the bypassed router for a lost flow record.

Using a User-Defined Script to Process FlowCollector Data Files

You can specify the location of a script file that FlowCollector executes after it has written a new data file. This capability makes it easier for your client applications to process a new data file without having to poll for it. FlowCollector invokes the script with the absolute path name of the newly written FlowCollector data file. FlowCollector expects the location of your user-supplied script to be defined by the **USER_SCRIPT_LOCATION** parameter in the **nf.resources** file. This parameter is read only at startup.

To use the **USER_SCRIPT_LOCATION** parameter, perform the following steps:

Step 1 Remove the comment character from the beginning of the **USER_SCRIPT_LOCATION** entry in the **nf.resources** file, so that it looks like this:

```
USER_SCRIPT_LOCATION    /opt/CSCOnfc/bin/userscript.sh
```

Step 2 Replace the existing path name with the path name for your script.

For example, if the path name for your script is **/opt/CSCOnfc/my_script.sh**, the revised parameter should read:

```
USER_SCRIPT_LOCATION    /opt/CSCOnfc/my_script.sh
```

Changing the Output Buffer Size

FlowCollector transfers output data in blocks to optimize performance and ensure the most efficient handling of data files as they are generated and written as disk files. The size of a block is user-configurable, and defined by the **OUTPUT_BUFFER_SIZE** parameter in the **nf.resources** file. The syntax of the parameter is

```
OUTPUT_BUFFER_SIZE size
```

where *size* is the new block size in megabytes. The valid sizes are 1, 2, 4, 8, and 16 megabytes. The recommended setting is approximately 1/32 of the physical memory installed in the FlowCollector workstation. For example, if the physical memory of your FlowCollector workstation is 128 MB, the best setting is 4. If you inadvertently enter an invalid number, FlowCollector uses the next smaller valid number. For example, if your system is equipped with 128 MB and you enter the number 6, FlowCollector uses the next smaller valid number, 4, as the output buffer size.

Configuring the Daemon (NFCD)

The Daemon (NFCD) provides high availability to the FlowCollector system. The Daemon is loaded as a configuration file called **nfcd.config** when the system is booted. It is located in the **$NFC_DIR/config** directory. The Daemon performs the following functions:

- automatically starts NFCollector and NFCGW upon system startup
- automatically restarts NFCollector and NFCGW if they terminate abnormally
- sets the scheduling priorities of NFCollector and NFCGW.

The following is an example of an **nfcd.config** file:

```
--------------------Begin nfcd.config --------------------
NFCD_LOGFILE   /opt/CSCOnfc/logs/nfcd.log
MAX_RESTART_ATTEMPTS   3


APPLICATION {
    PATH    /opt/CSCOnfc/bin/NFCollector
    PROGRAMFLAGS
    RESTART Yes
    AUTOSTART   Yes
    TMPFILES /tmp/nfcollector.pid
    SCHEDULING_PRIORITY {
        SCHEDULING_CLASS RealTime
        DEFAULT_PRIORITY -20
    }
}
APPLICATION {
    PATH    /opt/CSCOnfc/bin/NFCGW
    PROGRAMFLAGS    -i
    RESTART Yes
    AUTOSTART   Yes
    RETRY_INTERVAL 120
    TMPFILES /tmp/nfcgw.pid /tmp/nfc.events
    SCHEDULING_PRIORITY {
        SCHEDULING_CLASS RealTime
        DEFAULT_PRIORITY -20
    }
}
--------------- End of nfcd.config ------------------------
```

Note In NetFlow FlowCollector Release 3.6, configuration for the **RealTime** class process has been disabled, and the **SCHEDULING_CLASS** option is ignored.

Table 5-7 lists and describes the **nfcd.config** parameters.

Table 5-7 nfcd.config File Parameter Descriptions

Parameter	Variable Type	Description	Default
NFCD_LOGFILE	NFCD Config	Name and location of the **nfcd.log** file.	***$NFC_DIR/logs***
MAX_RESTART_ATTEMPTS	NFCD Config	Number of times that NFCD attempts to automatically restart NFCollector and NFCGW if they terminate abnormally.	3
PATH	APPLICATION	Path of NFCollector and NFCGW executable files.	**$NFC_DIR/bin**
PROGRAMFLAGS	APPLICATION	Flags used in invoking NFCollector and NFCGW. This can be used to pass “-i” to NFCGW, turning off authentication on HP-UX platforms.	Empty string
RESTART (Yes/No)	APPLICATION	Specifies whether NFCollector and NFCGW should be restarted by NFCD upon an abnormal exit.	No

Table 5-7 nfcd.config File Parameter Descriptions (continued)

Parameter	Variable Type	Description	Default
RETRY_INTERVAL	APPLICATION	If **RESTART** is set to **Yes**, this parameter specifies the number of seconds to wait before attempting to restart NFCollector and NFCGW.	1 second
AUTOSTART (Yes/No)	APPLICATION	Specifies whether NFCollector and NFCGW should be started when NFCD is started.	No
TMPFILES	APPLICATION	List of temporary files used by NFCollector and NFCGW. Not user- configurable.	Not applicable
SCHEDULING_CLASS	APPLICATION/ SCHEDULING_ PRIORITY	The scheduling class of the process executing NFCollector and NFCGW. Values include **RealTime** or **TimeShared**. This parameter is supported only on Solaris systems. For more details refer to the “**priocntl**” or “**nice**” Solaris man pages.	TimeShared
DEFAULT_PRIORITY	APPLICATION/ SCHEDULING_ PRIORITY	The default priority of the process. Acceptable values are in the range of [-20, 20]. This value applies to time-shared scheduling and is used when one of these conditions occurs. 1. No **SCHEDULING_CLASS** is specified. 2. No **SCHEDULING_CLASS** has the value **TimeShared**. 3. **SCHEDULING_CLASS** is set to **RealTime** and NFCD cannot set the scheduling class of the process to real time.	0

Managing Disk Space

Depending on the volume of flow data being exported from the export devices, as well as the FlowCollector thread attribute settings you use, FlowCollector can consume large amounts of disk space in a short period. FlowCollector provides several thread attributes and features that can help you manage your disk space usage:

- Filters (cannot be used with the **RawFlows** aggregation scheme)
- Aggregation schemes
- **NF_Thread** data file and disk space options
- Parameters in the **nf.resources** file.

Filters

As described earlier, a filter can help you discard any flow data that is not of interest to you. By using filters to ensure that you are storing only data of interest, you can potentially reduce the amount of disk space used by FlowCollector.

Aggregation Schemes

Aggregation schemes are used to define how you want FlowCollector to summarize the flow data being exported from your export devices. By using only those aggregation schemes required for your application and, when possible, by selecting the aggregation schemes that generate the least amount of data on disk, you can reduce the amount of disk space used by FlowCollector. For example, using the **HostMatrix** aggregation scheme results in less disk space usage than using the **DetailHostMatrix** scheme. Of course, the aggregation schemes you use are determined primarily by the data you are interested in and how you want to summarize that data. It is important to realize, however, that the different aggregation schemes can greatly affect the amount of disk space used by FlowCollector.

You can estimate the amount of UDP traffic that an export device generates when NetFlow data export is enabled. To do this you must understand the characteristics of the traffic in your network, including the average packets per second of switching throughput and the average number of packets per flow.

For example, if the average throughput on a NetFlow enabled export device is 150 packets per second and the average number of packets per flow is 100, you may have approximately 1500 flow records per second (150 x 100) to be exported by the export device. If NetFlow data export format Version 5 datagrams are used, you should expect approximately 50 NetFlow export datagrams per second (1500 flows/30 per export datagram) or 45 KB per second (30 x 1500 bytes per datagram) from the export device.

NF_Thread Data File and Disk Space Parameters

Optional parameters are available on a per **NF_Thread** basis to limit disk space and improve system performance at the same time. These parameters are documented in the "Creating a Thread" section on page 5-8. These parameters include:

- applying **gzip** compression to data files
- creating binary data files instead of ASCII format data files
- using a **MaxUsage** parameter to specify the amount of disk space used by data files before they are flushed.

Parameters in the nf.resources File

The **nf.resources** file contains parameters that assist in managing disk space. See the "Modifying FlowCollector Resources" section on page 5-30 for more details. These parameters include:

- the **CLEANUP_INTERVAL** parameter specifies the amount of time between each data file **CLEANUP_JOB**
- the **CLEANUP_JOB** parameter specifies the program or script to run at the end of the **CLEANUP_INTERVAL** parameter to flush data files
- the **DISK_USAGE_THRESHOLD** parameter provides a warning message when data files consume the maximum amount of disk space specified in the parameter.

Unsolicited Event Notifications

When FlowCollector encounters an error or needs to issue a warning on some aspect of FlowCollector operations, it generates messages to inform the user that something is wrong and needs to be addressed. These messages are called unsolicited event notifications (UENs). These messages do not appear within the FlowCollector application. Instead, they consist of UDP packets that are sent by NFCollector and received at the IP address and port number specified in the nf.resources file.

UENs are not enabled by default. You must edit the nf.resources file and indicate the IP address and port (or the DNS system name and port) where a client application is running and listening for these events. This parameter supports multiple entries formatted as a list.