



Ethernet Routing Switch
4500, 5000, 8300, 8600
Engineering

> IPFIX Technical Configuration Guide

Avaya Data Solutions
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Abstract

This document provides configuration procedures for Protocol Flow Information eXport (IPFIX) feature for the Ethernet Routing Switch 8600, 8300, 5000, and 4500 series as well as information pertaining to the Avaya IP Flow Manager.

Revision Control

No	Date	Version	Revised by	Remarks
1	May 1 st , 2008	1.0	PRMGT	Modifications to Software Baseline section
2	May 31 st , 2010	2.0	PRMGT, Kuntal Mondal and Shmulik Nehama	Additional information pertaining to ERS4500, 8300, and IP Flow Manager chapter

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Document Updates

- Added ERS 4500 and ERS 8300
- Added Avaya IP Flow Manager (IPFM)

Conventions

This section describes the text, image, and command conventions used in this document.

Symbols:



Tip – Highlights a configuration or technical tip.



Note – Highlights important information to the reader.



Warning – Highlights important information about an action that may result in equipment damage, configuration or data loss.

Text:

Bold text indicates emphasis.

Italic text in a Courier New font indicates text the user must enter or select in a menu item, button or command:

```
ERS5520-48T# show running-config
```

Output examples from Avaya devices are displayed in a Lucinda Console font:

```
ERS5520-48T# show running-config
```

```
! Embedded ASCII Configuration Generator Script
! Model = Ethernet Routing Switch 5520-24T-PWR
! Software version = v5.0.0.011
enable
configure terminal
```

1. Overview: Internet Protocol Flow Information eXport (IPFIX)

Internet Protocol Flow Information eXport (IPFIX) has evolved as an improvement upon the Netflow V9 protocol. It is a standard that has been proposed by an IETF Working Group - <http://www.ietf.org/html.charters/ipfix-charter.html>. IPFIX is an effort to standardize on architecture for IP flow measurement and export. In an IPFIX model, an exporter such as a switch or router collects IP flows and then exports the IP flow information using a transport protocol to a collection server or servers. An IP flow is defined as a set of packets over a period of time that has some common properties.

1.1 IPFIX Support on Avaya Switches

Feature	ERS5000	ERS4500 ¹	ERS8300 ²	ERS8600 ³
Software Level introduction	5.0	5.4	4.2	4.1
Metering and Collecting	Yes			
Collector Default UDP Port	9995			
Collector Supported	Avaya IP Flow Manager (IPFM), NetQoS Harvester/Collector, Fluke Collector			
Filters Supported	No			Yes
Number of IPFIX Collectors Supported	2			
Exported Traffic	<ul style="list-style-type: none"> • Protocol type • Source IP • Destination IP • Ingress port • Type-of-service byte • TCP/UDP source port • TCP/UDP destination port 		<ul style="list-style-type: none"> • Source IP • Destination IP • Protocol Type • Source protocol port • Destination protocol port • Type-of-service byte • Byte/packet count • Ingress VLAN ID • Ingress port and observation point (VLAN or port) 	

Table 1: IPFIX support on ERS8600 ERS5000, and ERS4500

1 – If IPFIX is enabled, a QoS policy precedence is used

2 - The switch will automatically disable IPFIX if CPU utilization exceeds 90% or if there is less than 2 Mb of system memory available. The switch will automatically enable IPFIX again when CPU utilization returns to less than 50% or there is 5 Mb of system memory available. The disabling and enabling of IPFIX will not affect the IPFIX configuration.

3 – Required R/RS modules, not supported on legacy modules

1.2 DSCP/TOS

Please note that DSCP/TOS value collected by IPFIX depends on how a port is configured on an Ethernet Routing Switch. For example, if a port is configured as untrusted, the TOS/DSCP value is remarked for 0x00. Hence, all IPFIX flows collected by IPFIX will also display the appropriate value. If filters are used to remark traffic, then IPFIX will display the DSCP/TOS value according to how the filter or filters remark the traffic.

1.3 IPFIX with Filters

By default, IPFIX will collect all traffic as shown in table 1 above. Filters can be used with IPFIX on the Ethernet Routing Switch 8600. This allows IPFIX to collect traffic only for specific flows according to the traffic filter or filters configured or simply to cut down on the amount of traffic collected. Note that this feature is not supported on the Ethernet Routing Switch 8300.

1.4 IPFIX Collectors

Collectors can be enabled or disabled on the switch. Up to two collectors are supported and if both are enabled, the same information is sent to both collectors. Exported traffic from the switch is in Netflow v9 format using UDP as the transport protocol using UDP port 9995. The export interval, which specifies the interval at which updates are sent to the collector, is configurable.

2. IPFIX Configuration on ERS 8600 & ERS 8300:

2.1 Enabling IPFIX globally and on a port level

To enable or disable IPFIX globally, enter the following command.

CLI:

- ERS-Switch(config)# **ip ipfix enable**
- ERS-Switch(config)# **no ip ipfix enable**

PPCLI:

- ERS-Switch# **config ip ipfix state <enable/disable>**

To enable IPFIX on a port level, enter the following command:

CLI:

- ERS-Switch(config)# **interface <FastEthernet/ GigabitEthernet> <slot/port>**
- ERS-Switch(config-if)# **ip ipfix enable**

PPCLI:

- ERS-Switch# **config ip ipfix port <slot/port> all-traffic enable**

Additional port parameters specific to ERS 8600 and ERS 8300

CLI:

- ERS8600(config-if)# **ip ipfix ?**

<code>enable</code>	To enable ipfix
<code>hash-key</code>	To set hash-key
<code>hash-polynomial-coeffs</code>	To set hash-polynomial-coeff
<code>hash-polynomial-seed</code>	To set hash-polynomial-seed
<code>port</code>	Ipfix configuration on a specified port
<code>sampling-rate</code>	To set sampling rate
- ERS8300(config-if)# **ip ipfix ?**

<code>enable</code>	To enable ipfix
<code>port</code>	Ipfix configuration on a specified port

PPCLI:

- ERS-8600# **config ip ipfix port <slot/port> ?**

Sub-Context:

Current Context:

```

all-traffic <enable|disable>
flush [export-and-flush]
hash-key <id>
hash-polynomial [coeffs <value>] [seed <value>]
info
sampling-rate <1-100000>
    
```


- ERS-8300# **config ip ipfix port <slot/port>?**

```
Sub-Context:
Current Context:
  all-traffic <enable|disable>
  flush [export-and-flush]
  info
```

where:

Parameter	Description
all-traffic	Enables or disables metering on all traffic.
flush	Specifies that the records be flushed. You can export records before flushing.
hash-key	<p>Enter a hash-key id from 1 to 4 or hashKeyOne hashKeyTwo hashKeyThree hashKeyFour.</p> <p>Hash Key 1 – Use all bits of source IP (lower 20-bits), destination IP (lower 19-bits), Protocol (1-5 bits), Source Port (lower 10 bits), and Destination Port (lower 10 bits).</p> <p>Hash Key 2 – Use lower 20-bits of source IP, lower 19-bits of Destination IP, and lower 24 bits of protocol (8-bits), source port (16-bits) and destination port (16-bits)</p> <p>Hash Mask 3 – Use source IP (32-bits) and destination IP (32-bits)</p> <p>Hash Mask 4 – Use source IP (32-bits), source port (16-bits) and destination IP (16-bits)</p> <p>Default setting is hashKeyOne (1).</p>
hash-polynomial	Specifies the coefficient and seed values. Note: If you do not specify a coefficient, the default value (0x7cc) is used. If you do not specify a seed value, the default value (0) is used.
info	Displays current configuration.
sampling-rate	Configures the IPFIX sampling rate from 1 to 10,000 for every N packets. The default setting is 1 for continuous monitoring.

2.2 Setting IPFIX timers

CLI (same output as shown via PPCLI below):

- ERS 8600
 - ERS-8600(config)# **ip ipfix slot <slot #> ?**
- ERS 8300
 - ERS-8300(config)# **ip ipfix ?**

PPCLI:

- ERS 8600
 - ERS-8600# **config ip ipfix slot <slot #> ?**
 Sub-Context: collector
 Current Context:
 active-timeout <value in mins>
 aging-interval <value in secs>
 export-interval <value in secs>
 exporter-state <enable|disable>
 info
 template-refresh [refresh-interval <value>] [packets <value>]
- ERS 8300
 - ERS-8310# **config ip ipfix ?**
 Sub-Context: collector port
 Current Context:
 active-timeout <value in mins>
 aging-interval <value in secs>
 export-interval <value in secs>
 exporter-state <enable|disable>
 info
 state <enable|disable>
 template-refresh [refresh-interval <value>] [packets <value>]

where:

Parameter	Description
active-timeout	Specifies the active timeout in minutes. Range is from 1 to 60 minutes.
aging-interval	Specifies the interval, in minutes, when to flush out the old flows after they have stopped. Range is from 10 to 3600 seconds. Default setting is 30 minutes.
export-interval	Specifies the interval, in seconds, between exports. Range is from 10 to 3600 seconds. Default value is 50 seconds.
exporter-state	Indicates whether IPFIX is enabled or disabled on the switch.
info	Displays configuration.

template-refresh	Specifies the interval, in seconds, between refreshes and the interval, in number of packets, between refreshes. Range for interval is 300 to 3600 seconds. Range for packets is 10,000 to 100,000.
------------------	---

2.3 IPFIX Collector Configuration

The following command is used to configure an IPFIX collector.

CLI:

- ERS 8300
 - ERS-8300(config)# **ip ipfix collector <ipaddr> ?**
 - ERS 8600
 - ERS-8600(config)# **ip ipfix collector <slot#> <ipaddr> ?**
- dest-port Destination port
 enable State of the collector
 exporter-ip Ip address of the exported traffic
 protocol Type of the protocol
 protocol-version Ipfix protocol version

PPCLI:

- ERS 8300:
 - ERS-8300# **config ip ipfix collector ?**
- ERS 8600
 - ERS-8600# **config ip ipfix slot <slot #> collector ?**

Sub-Context:

Current Context:

```

add <ipaddr> [protocol <value>] [dest-port <value>] [exporter-
ip <value>] [protocol-version <value>] [enable <value>]
info
remove <ipaddr>
  
```

where:

Parameter	Description
slot#	Indicates the slot for the collector. Note: If you do not specify a slot, the command applies to all slots.
<ipaddr>	Specifies the IP address of the collector you are adding.
protocol	Specifies the protocol to use. UDP is the default.
dest-port	Specifies the destination port.

exporter-ip	Specifies the IP address of the exporter. If you do not specify an exporter-ip, the source-ip is chosen from Virtual IP, management IP, or outgoing interface IP based on collector-ip reachability.
protocol-version	Selects the protocol version (ipfix ipfixv9 preipfixv5). Default is ipfixv9.
[enable<true false>]	Set this to add the collector (true) or not add collectors (false).

2.4 Using out-of-band Management with Management Virtual IP address

On the ERS8600 and ERS8300, special consideration should be used when using the out-of-band management port on the CPU card. By default, the switch will use the out-of-band IP address assigned to the CPU card if there is a valid route to the IPFIX Collector even if a management virtual IP address is configured. If you have two CPU cards, two out-of-band IP addresses will be used one for each CPU card. If a virtual management IP address is used, you should also enabled the *udpsrc-by-vip* parameter so that only the management virtual IP address will used for IPFIX packets sent to the IPFIX collector. This allows you to only have to configure one IP address for the switch on the IPFIX collector instead of a possible two if two CPU cards are used. The configuration is as shown below.

CLI:

- ERS-Switch(config)# **sys mgmt-virtual-ip <ipaddr/mask>**
- ERS-Switch(config)# **udpsrc-by-vip**

PPCLI:

- ERS-Switch# **config sys set mgmt-virtual-ip <ipaddr/mask>**
- ERS-Switch# **config sys set udpsrc-by-vip enable**

3. IPFIX Configuration Examples for the ERS 8600

3.1 IPFIX Configuration Example for the ERS 8600:

For this configuration example, we will configure the following:

- Enable IPFIX collecting on port 7/26
- Configure the IPFIX active-time to 30 seconds. This will allow viewing the IPFIX flows on port 7/26 for up to 30 seconds.
- Add an IPFIX collector which has an IP address of 172.30.30.20. We will leave the default setting of protocol type UDP with a dst-port of 9995.

3.1.1 Configuration

To accomplish the above, please enter the following commands:

ERS 8600: Step 1 – Enable IPFIX globally

CLI:

```
ERS-8600(config)# ip ipfix enable
```

PPCLI:

```
ERS-8600# config ip ipfix state enable
```

ERS 8600: Step 2 – Enable IPFIX on port 7/26

CLI:

```
ERS-8600(config)# interface gigabitEthernet 7/26
```

```
ERS-8600(config-if)#ip ipfix enable
```

```
ERS-8600(config-if)# exit
```

PPCLI:

```
ERS-8600# config ip ipfix port 7/26 all-traffic enable
```

ERS 8600: Step 3 – Change the aging timeout to 30 seconds

CLI:

```
ERS-8600(config)# ip ipfix slot 7 active-timeout 30
```

PPCLI:

```
ERS-8600# config ip ipfix slot 7 active-timeout 30
```

ERS 8600: Step 4 – Add the IPFIX Collector

CLI:

```
ERS-8600(config)# ip ipfix collector 7 172.30.30.20 enable
```

PPCLI:

```
ERS-8600# config ip ipfix slot 7 collector add 172.30.30.20 enable true
```

3.1.2 Verify Operations

Step 1 – Enter the following command to display the IPFIX flows. Note that IPFIX flows will be timed out after 30 seconds:

```
ERS-8600# show ip ipfix flows 7
```

Result:

```

=====
                        IPFIX Flows
=====
Slot Number : 7                               Total Number Of Flows : 6

Port/  SrcIP/DstIP   Src/  Protocol/ DSCP/   Start/Last   SrcMac/DstMac   Byte/Pkt
Vlan  Addr              Dst   Obsv      TcpFlag  Time          Time            Count
-----
7/26  198.19.1.2        1019  tcp       0        MAR 21 14:19:02 00:00:00:00:00:09 80896
500   198.19.1.1        80    Port     ack      MAR 21 14:19:02 00:00:00:01:00:0a 632

7/26  10.1.1.100        1024  udp       0        MAR 21 14:19:02 00:00:00:00:00:09 54016
500   10.1.1.101        69    Port     none     MAR 21 14:19:02 00:00:00:00:00:0a 422

7/26  198.19.1.2        1031  tcp       64       MAR 21 14:19:02 00:00:00:00:00:09 27008
500   198.19.1.1        53    Port     none     MAR 21 14:19:02 03:00:b0:57:00:03 211

7/26  198.19.1.2        1024  tcp       16       MAR 21 14:19:02 00:00:00:00:00:09 107776
500   198.19.1.1        21    Port     none     MAR 21 14:19:02 00:00:d0:01:00:09 842

7/26  198.19.1.2        1028  udp       0        MAR 21 14:19:02 00:00:00:00:00:09 80896
500   198.19.1.1        25    Port     none     MAR 21 14:19:02 00:0a:0b:00:00:0a 632

7/26  198.19.1.2        1036  tcp       0        MAR 21 14:19:02 00:00:00:00:00:09 161408
500   198.19.1.1        123   Port     urg      MAR 21 14:19:02 00:00:a0:51:00:1a 1261

Total number of Displayed Flows on Slot 7 : 6

```

Step 2 – To view the IPFIX collector configuration information, enter the following:

CLI:

```
ERS-8600# show ip ipfix collector 7
```

PPCLI:

```
ERS-8600# show ip ipfix collector-info 7
```

Result:

```

=====
                        IPFIX Collector-Info
=====
SlotNum Collector      Enable  Protocol  Dest-Port  Exporter      Protocol
      IP-Address        State            IP-Address  IP-Address    Version
-----
7      172.30.30.20         true    udp        9995         0.0.0.0       preipfixv9

```

3.2 Configuring IPFIX with ACL's on the ERS 8600

In configuration example 3.1, port 7/26 was setup to capture all traffic via IPFIX. In this configuration example, we will setup IPFIX to only capture traffic based on ACL's. Assuming the Ethernet Routing Switch 8600 has been configured with VLAN 500 using an IP subnet of 198.19.1.0/24, we will configure the following:

- We will setup an ACL to supply IPFIX flows only for traffic with a source IP address of 198.19.1.4 from any port via VLAN 500.
- *For this configuration example, we will enable the IPFIX flag at the ACE level.
- Add an IPFIX collector which has an IP address of 172.30.30.20.



The Ethernet Routing Switch 8600 supports the ability to filter IPFIX flows at the ACL (global level) level or at the ACE (individual filter) level. When setting up an ACL, you can configure a global action to either enable or mirror IPFIX with or without statistics. When IPFIX is enabled at the ACL global level, IPFIX collection is applied to all ACE's. If you do not enable IPFIX at the ACL global level, you can still enable IPFIX for each individual filter at the ACE level. This will provides greater control over which ACE's you wish to collect IPFIX flow on.

If you plan to use ACL with IPFIX, please do not enable IPFIX at the port level.

3.2.1 Configuration

To accomplish the above, please enter the following commands:

ERS 8600: Step 1 – Enable IPFIX globally

```
CLI:
ERS-8600(config)# ip ipfix enable

PPCLI:
ERS-8600# config ip ipfix state enable
```

ERS 8600: Step 2 – Add the IPFIX Collector

```
CLI:
ERS-8600(config)# ip ipfix collector 7 172.30.30.20 enable

PPCLI:
ERS-8600# config ip ipfix slot 7 collector add 172.30.30.20 enable true
```


ERS 8600: Step 3 – Configure the Filter. For this example, we will use ACT 3 and ACL 2. Please note that either the ACL or the ACE(s) can be configured with the IPFIX flag. If configured at the ACL level, the IPFIX flag is global and will be applied to all ACE's. If configured at the ACE level, the IPFIX flag only applies to this particular ACE. For this example, the ACE flag is configured for IPFIX.

CLI:

```
ERS-8600(config)# filter act 3
ERS-8600(config)# filter act 3 ip srcIp
ERS-8600(config)# filter act 3 ip srcIp
ERS-8600(config)# filter apply act 3
ERS-8600(config)# filter acl 2 type inVlan act 3
ERS-8600(config)# filter acl 2 type inVlan act 3
ERS-8600(config)# filter acl vlan 2 500
ERS-8600(config)# filter acl ace 2 1 name Src_IP
ERS-8600(config)# filter acl ace action 2 1 permit ipfix enable
ERS-8600(config)# filter acl ace ip 2 1 src-ip eq 198.19.1.4
ERS-8600(config)# filter acl ace 2 1 enable
```

PPCLI:

```
ERS-8600# config filter act 3 create
ERS-8600# config filter act 3 ip srcIp
ERS-8600# config filter act 3 apply
ERS-8600# config filter acl 2 create inVlan act 3
ERS-8600# config filter acl 2 vlan add 500
ERS-8600# config filter acl 2 ace 1 create name "Src_IP"
ERS-8600# config filter acl 2 ace 1 action permit ipfix enable
ERS-8600# config filter acl 2 ace 1 ip src-ip eq 198.19.1.4
ERS-8600# config filter acl 2 ace 1 enable
```

3.2.2 Verify Operations

Step 1 – View IPFIX Flows:							
ERS-8600# <i>show ip ipfix flows 7</i>							
Result:							
<pre> ===== IPFIX Flows ===== Slot Number : 7 Total Number Of Flows : 1 Port/ SrcIP/DstIP Src/ Protocol/ DSCP/ Start/Last SrcMac/DstMac Byte/Pkt Vlan Addr Dst Obsv TcpFlag Time 00:00:00:00:01:09 542092160 ----- 7/26 198.19.1.4 1231 tcp 0 APR 12 16:17:32 00:00:00:00:01:09 542092160 500 198.19.1.5 21 FiltVlan 63 APR 12 16:17:34 00:00:00:00:01:0a 4235095 Total number of Displayed Flows on Slot 7 : 1 </pre>							



Notice that under the Protocol column that 'FiltVlan' is displayed to indicate that IPFIX flows displayed are based on the ACL settings.

4. IPFIX Basic Configuration for ERS 5000 and ERS 4500:

4.1 Enabling IPFIX globally and on a port level

To enable or disable IPFIX globally, enter the following command.

- ERS-Stackable(config)# **ip ipfix enable**
- ERS-Stackable(config)# **no ip ipfix enable**

To enable IPFIX on a port level, enter the following command:

- ERS-Stackable(config)# **interface fastEthernet <all|port #>**
- ERS-Stackable(config-if)# **ip ipfix enable**
- ERS-Stackable(config-if)# **ip ipfix port <port #> enable**

4.2 Setting the IPFIX timers

To set the IPFIX globally, enter the following command.

- ERS-Stackable(config)# **ip ipfix slot ?**
LINE slot list (1 for standalone; 1- n for n high stack)
- ERS-Stackable(config)# **ip ipfix slot 1 ?**
aging-interval Set flow record aging interval
- ERS-Stackable(config)# **ip ipfix slot 1 aging-interval ?**
<0-2147400> aging interval value (seconds)

4.3 Adding a Collector

To add an IPFIX collector address, enter the following command. Up to two collectors can be added.

- ERS-Stackable(config)# **ip ipfix collector <a.b.c.d> enable**

The following commands are used to display the IPFIX flows.

- ERS-Stackable# **show ip ipfix table sort-by ?**

byte-count	Byte number
dest-addr	Destination address
first-pkt-time	First packet time
last-pkt-time	Last packet time
pkt-count	Packet number
port	Port number
protocol	Protocol number
source-addr	Source address
TCP-UDP-dest-port	TCP/UDP destination port
TCP-UDP-scr-port	TCP/UDP source port
TOS	TOS

- ERS-Stackable# **show ip ipfix table sort-by <item> sort-order <ascending/decending> display ?**

all	Display all entries
top-10	Display first 10 entries
top-100	Display first 100 entries
top-200	Display first 200 entries
top-25	Display first 25 entries
top-50	Display first 50 entries

5. IPFIX Configuration Examples for the ERS 5000 or ERS 4500

5.1 IPFIX Basic Configuration for Ethernet Routing Switch:

For this configuration example, we will configure the following:

- Enable IPFIX collecting on a standalone Ethernet Routing Switch ports 12 and 13
- Configure the IPFIX active-time to 30 seconds. This will allow viewing the IPFIX flows on port 12 for up to 30 seconds.
- Add an IPFIX collector which has an IP address of 172.30.30.20. We will leave the default setting of UDP dst-port 9995.

5.1.1 Configuration

ERS-STACKABLE: Step 1 – Enable IPFIX globally
ERS-Stackable(config)# <i>ip ipfix enable</i>
ERS-STACKABLE: Step 2 – Enable IPFIX on port 7/26
ERS-Stackable(config)# <i>interface fastEthernet 12,13</i>
ERS-Stackable(config)# <i>ip ipfix enable</i>
ERS-Stackable(config)# <i>exit</i>
ERS-STACKABLE: Step 3 – Change the aging timeout to 30 seconds
ERS-Stackable(config)# <i>ip ipfix slot 1 aging-interval 30</i>
ERS-STACKABLE: Step 4 – Add the IPFIX Collector
ERS-Stackable(config)# <i>ip ipfix collector 1 172.30.30.20 enable</i>

5.1.2 Verify Operations

Step 1 – Enter the following command will display the IPFIX results on a standalone switch sorted by the source IP address in ascending order::

```
ERS-Stackable# show ip ipfix table 0 sort-by source-addr sort-order ascending display all
```

Result:

IP SA	IP DA	TOS	PROTOCOL	TCPSRC	TCPDEST	UNIT	PORT
PACKET	BYTE	FIRSTTIME		LASTTIME			
10.120.120.013 697	10.120.120.014 47396	0 1 day, 22:46:20	UDP	0 1 day, 22:47:13	0	0	13
10.120.120.013 697	10.120.120.014 47396	0 1 day, 22:46:20	UDP	1024 1 day, 22:47:13	1025	0	13
10.120.120.013 695	10.120.120.014 55600	2 1 day, 22:46:20	TCP	1025 1 day, 22:47:13	21	0	13
10.120.120.013 700	10.120.120.014 100800	0 1 day, 22:46:20	TCP	1024 1 day, 22:47:13	80	0	13
10.120.120.013 680	10.120.120.014 707200	0 1 day, 22:46:20	TCP	80 1 day, 22:47:13	1250	0	13

Step 2 – To view the IPFIX collector configuration information, enter the following:

```
ERS-Stackable(config)# show ip ipfix collector
```

Result:

```
Collector 1
-----
IP Address          172.30.30.20
Network Protocol    udp
Destination Port    9995
Exporter IP Address 0.0.0.0
Protocol Version    preipfixv9
State               enabled
```

6. Avaya's IP Flow Manager (IPFM)

Avaya's IP Flow Manager (IPFM) application can be used as an IPFIX collector to analyze IP flow from any NetFlow v5 or NetFlow v9 enabled devices. All management is provided through a Web-based user interface.

IP Flow Manager is one of the Unified Communications Management (UCM) applications offered by Avaya Data Networking division. It is a web based network monitoring application that reports both Data & Voice traffic usage patterns and user behavior on the network. IPFM provides the visibility into application usage including who, what, when, & where - leading to increased productivity and more accurate network capacity planning. Using IPFM user can monitor utilization on a core or edge router as well as the traffic causing the utilization which in turn helps network admin to understand how network is functioning and also helps to anticipate probable occurrence of network outage, link failure and system downtime.

IPFM can be installed as a standalone UCM application or can co-exist with other UCM applications for demonstration only. For performance considerations it is always strongly recommended to install IPFM on a separate server while achieving interworking with other UCM applications through UCM Common Services (refer to UCM product documentation).

Following section describes few troubleshooting topics which user may face during IPFM installation, configuration and/or monitoring.

6.1 IPFM Supported Devices

IP Flow Manager supports the following Avaya devices

- ERS 4500 Release 5.4 or higher both in standalone and stacked configuration
- ERS 5500 Release 5.0 or higher both in standalone and stacked configuration
- ERS 5600 Release 6.0 or higher both in standalone and stacked configuration
- ERS 8300 Release 4.2 or higher
- ERS 8600 Release 4.1 (R or RS Modules) or higher

6.2 IPFM Features and Capabilities

6.2.1 Dashboard

The IPFM Dashboard provides an at-a-glance view of:

- Devices list the enabled within IPFM to receive IPFIX packet and whether the IPFM server is receiving data.
- Events list the devices that have encountered a threshold being exceeded or reset.
- Top 10 Applications as analyzed by IPFM within the monitored network.
- Top 10 Conversations as analyzed by IPFM within the monitored network.

6.2.2 Top 10 Views

The Top 10 Views provides the following reports

- Top 10 Applications
- Top 10 Conversations
- Top 10 Hosts
- Top 10 Ports
- Top 10 Protocols
- Top 10 Subnets

Right-click menu options allows user to launch a detailed report (e.g. selecting a protocol (OSPF/IGP) in this example launches “Top 10 Conversations” related to it. Charts can be redrawn in pie or bar format, by selecting different table entries (minimum selection count is 2). Also -- Find conversational Slot / Port information quickly (in “Top 10 Conversations” View) with a right click. User can disable or enable applications so that the desired application for monitoring will show up in the Top 10 Applications.

6.2.3 Monitoring Applications

Out of the box, IPFM supports all protocols as specified by IANA.org while the user can easily customize and add & configure new protocols by defining a name and composing an expression for protocol and port numbers using operators AND, OR, IN and “=”. Here are a couple of examples:

Chat-TCP	protocol = TCP AND (port = 194 OR port = 994 OR port = 1863 OR port = 5190 OR port IN 6667-6669)
Chat-UDP	protocol = UDP AND (port = 517 OR port = 518 OR port = 4000)

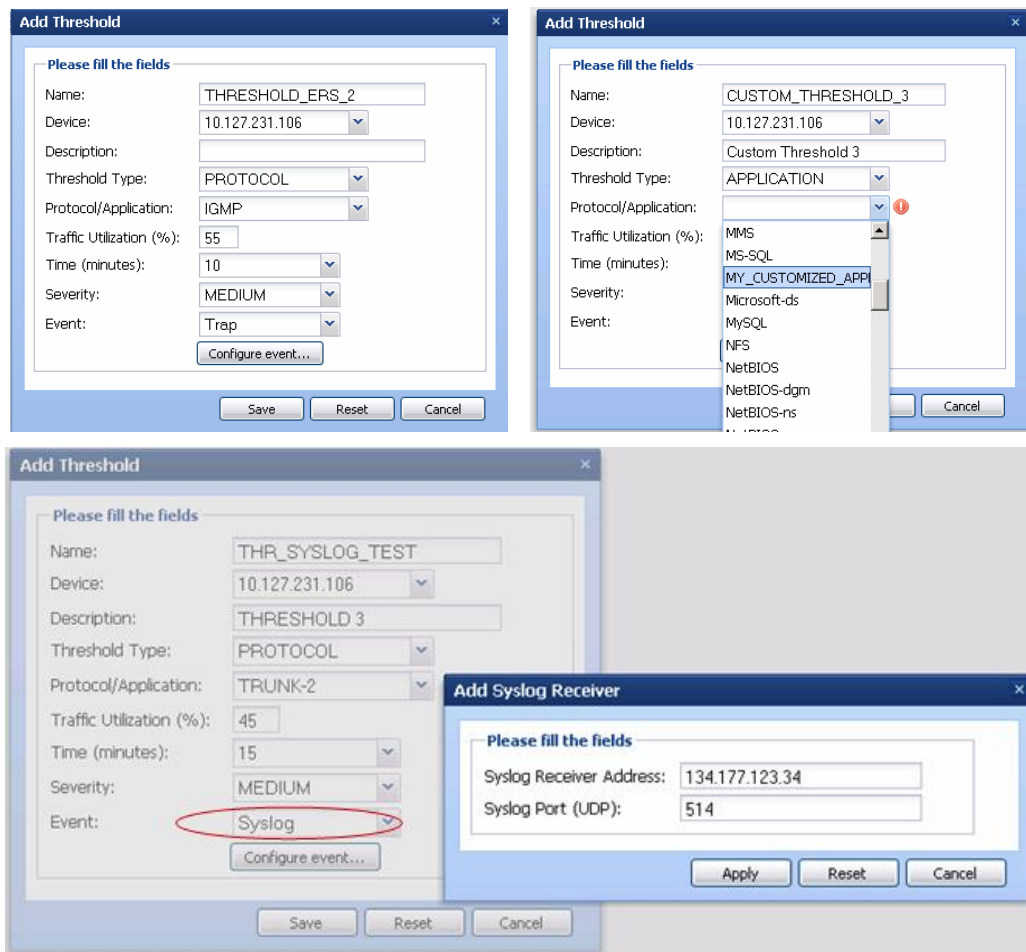
Following are the 12 VoIP protocols supported out of the box in IPFM:

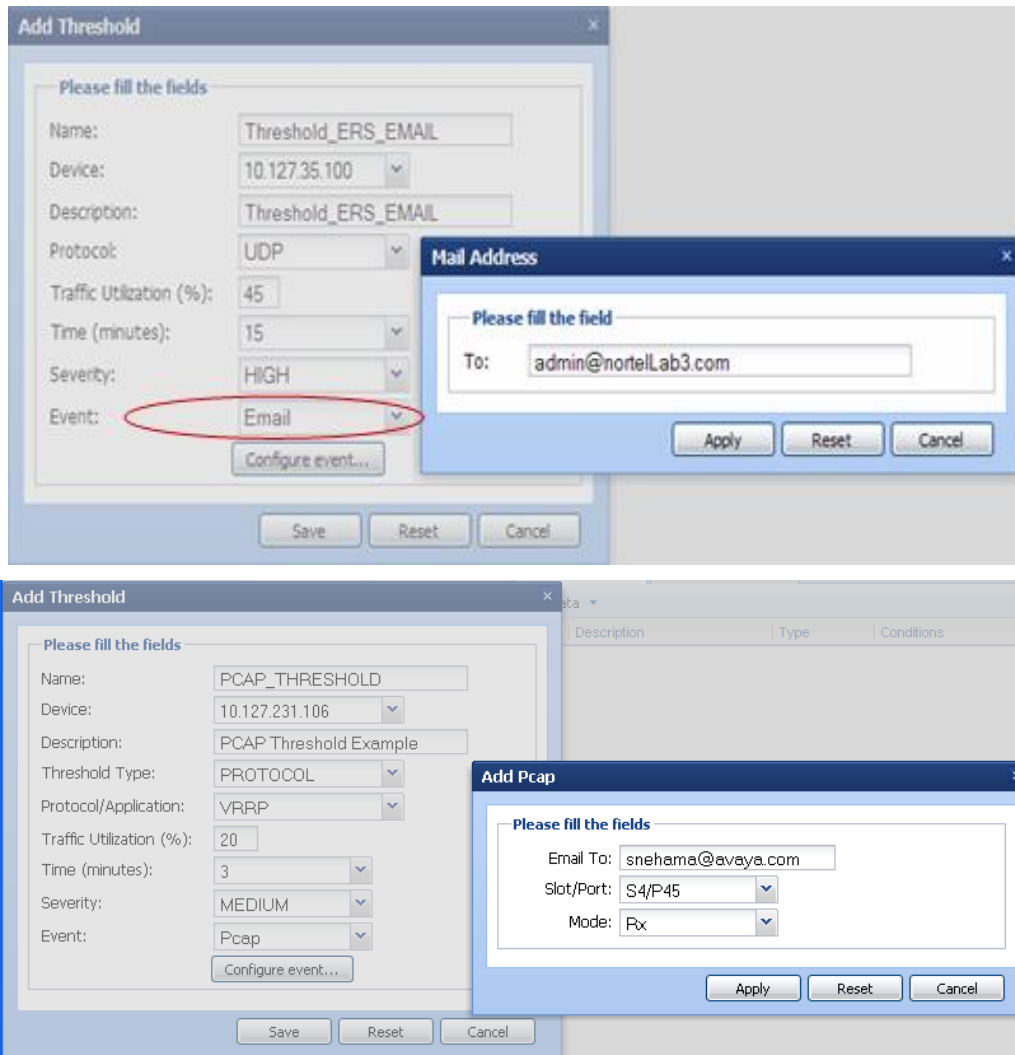
- SIP-TLS (MS OCS)
- SIP
- RTP/RTCP-CS1000
- RTP/RTCP-BCM
- RTP/RTCP-IPSets
- RTP/RTCP_ITG
- Voice-H.323
- Voice-Megaco-H.248
- Voice-MGCP
- Unistim-CS1000
- Unistim-BCM
- Unistim-MCS

6.2.4 Threshold and Events

IPFM allows the user to configure thresholds to facilitate monitoring of the network without continually watching onscreen reports. Four Event notifications are available (one per threshold):

- SNMPv1 (Trap)
- Syslog
- Email (SMTP)
- PCAP (for ERS 8600 only)





For ERS 8600 devices, user can invoke a Packet Capture any time, as well as can setup a threshold which, being exceeded provides an automatic packet capture to enable network admin to have real time visibility into all traffic traversing thru a port in the ERS.

Thresholds can be disabled / enabled any time. Events generated by traffic exceeding the thresholds will show in the events window on the IPFM Dashboard.

6.3 IPFM Installation Tips

IPFM is provided with pre-install checks script that will greatly simplify the installation process. Run the pre-install checks script and resolve the errors indicated in the log.

Following are some Tips & Tricks around IPFM installation.

6.3.1 User cannot access UCM / IPFM Login page in browser

Make sure IPFM services and other dependent services are all running in proper manner.

- In Red Hat Enterprise Linux Platform, open a console window and invoke the following commands.

```
ps -ef grep | jbossd
ps -ef grep | collector
ps -ef grep | mysql
ps -ef grep | LSM
```

For each of the above commands there will be a valid process running. If some process is not running then further investigation will be needed in that specific area.

- In case of RHEL platform make sure that user has "/var" and "/tmp" directory with "write" permission.
- In Windows 2003 Enterprise Server SP2 Platform, open Windows Service Panel by clicking:

"Start → Programs → Administrative Tools → Component Services"

or

"Start → Programs → Run → type services.msc → Ok"

Make sure all of the following services are running.

```
Nortel UCM JBoss AS
Nortel UCM IPFIX Collector
Nortel UCM License Service
Nortel UCM MySQL
```

If some process is not running then further investigation will be needed in that specific area.

6.3.2 Installation completes successfully, but after launching IPFM Dashboard user gets error message dialog with "PersistenceException" and/or "Device Error".

IPFM database creation did not complete successfully during installation. Most probable reason is password for MySQL root user was not entered correctly.

Note that initially both the UCM admin user password and MySQL root user password are same. But user can always change UCM admin user password using UCM UI which does not change the MySQL root user password. Thus, if user changes UCM admin user password and then installs IPFM as a member UCM application, user must need to provide MySQL root user password during IPFM installation, not the updated UCM admin user password.

To verify that the IPFM database was created successfully, user needs to open a console window and go to MySQL/bin directory. Generally this directory can be located at:

```
For Windows      C:\Program Files\MySQL\MySQL Server 5.1\bin
For RHEL         /opt/mysql/bin
```

Login to MySQL as "root" and run the SQL command: "show databases;". There must be an entry: "ipfm". Execute the following 2 SQL commands at the SQL prompt:

```
use ipfm;
show tables;
```

On SQL prompt user should see 37 table entries.

To recreate IPFM database, user needs to

- Stop "UCM JBoss service" and "IPFM Collector Service".
- Open a console window and go to MySQL/bin directory (see above).
- Login to MySQL as "root" and run the following 3 SQL commands:


```
DROP DATABASE IF EXISTS ipfm;
CREATE DATABASE ipfm;
GRANT ALL privileges ON ipfm.* to 'eccuser'@'localhost'
    identified by 'eccpassword' with grant option;
```
- Open a console window and go to IPFM Collector directory. Generally this directory can be located at:


```
For Windows C:\Program Files\Nortel\UCM\IPFM\ipfix_collector
For RHEL     /opt/nortel/ucm/ipfm/ipfix_collector
```
- Execute the following command to create IPFM tables


```
For Windows collectorCtrl.bat   recreatedb
For RHEL     ./collectorCtrl.sh  recreatedb
```
- Restart UCM JBoss service and wait for few minutes for JBoss initialization to complete successfully.
- Restart IPFM Collector Service.

6.4 IPFM Device Configuration

6.4.1 The device status is always shown as "Inactive" in IPFM Dashboard

- Make sure IPFIX Collector configuration in ERS switch is valid and flow data is forwarded to IPFM server. Sometime there may be a routing issue in network. To validate flow data is coming to IPFM server user can install Wireshark application in the same m/c where IPFM is installed and check if flow data is coming there.
- Make sure IPFM collector service is active and running.
- Make sure that IPFM Collector service has received the device-add notification when user added the ERS device IP in IPFM dashboard. To verify this user needs to open a console window and go to IPFM Collectors log directory. Generally this directory can be located at:

For Windows C:\Program Files\Nortel\UCM\IPFM\ipfix_collector\log

For RHEL /opt/nortel/ucm/ipfm/ipfix_collector\log

- Open **ipfix_collector.log** file using an editor and search for the specific Device IP with "Registering" keyword.

If there is no such entry in log file, restart IPFM Collector Service so that it can load all Device IP(s) from database and start listening traffic from those devices.

Note that the determination of a device being Active or Inactive is solely based on if IPFIX data is received within the recent 20 minutes by IPFM server from the specific device.

6.4.2 After changing UDP port definition in IPFM UI, no new flow data is received

- Make sure the switch configuration has the same UDP port definition for exporting flow data.
- Restart the IPFM collector service after changing the UDP port number.
- On slower machines, it is possible that the IPFM collector service times out while communicating to Jboss since Jboss service can take a longer time to properly complete its initialization. In such scenario the devices in IPFM Dashboard will appear as "Inactive". To resolve this issue, user must re-start IPFM Collector service manually after the Jboss service has started successfully. User can use "Services panel" (in Windows platform) or CLI (in RHEL) to restart Collector service.

6.4.3 User cannot invoke packet capture from IPFM UI

- Packet capture feature is supported only by ERS 8600 device family.
- Ensure that ERS 86XX device has Dual CPU (8692 cards).
- Ensure that ERS 86XX device has set the boot config flag: "ha-cpu" to false. (Use "show bootconfig flags" command to view the bootconfig flags)
- Ensure that ERS 86XX device has set the boot config flag: "ftpd" to true. (Use "show bootconfig flags" command to view the bootconfig flags)
- Ensure that ERS 86XX device has set "File capture mode" to use "PCMCIA" device.(Use "show diag pcap info" command to view the Pcap config flags).

- Ensure that ERS 86XX device has "PCMCIA cards" inserted in each "CPU Slot".
- Ensure that ERS 86XX device has set "PCAP File Size" to the minimum value which is 2 MB.(Use "show diag pcap info" command to view the PCap config flags).
- Ensure that IPFM Server has already collected few traffic data from that ERS 86XX device before user invokes PCAP operation from IPFM.
- Ensure that IPFM Server has valid SNMP (v1 or v3) & FTP Credentials for that ERS 86XX device.
- Ensure that IPFM Server is able to invoke FTP commands to the Standby CPU (of ERS 86XX device) to retrieve the generated PCAP file stored on the "PCMCIA card".
- Ensure that "Packet Capture Duration" value provided in IPFM UI (IP Flow Manager -> Configuration ->

Capture Duration) is long enough for the device to generate a PCAP file. Otherwise increase the "Packet Capture Duration" value and re-invoke PCAP workflow.

6.4.4 No flow data is received when Virtual IP address is used in IPFM (applicable for ERS 8600 only)

When using the out-of-band mgmt interface if the virtual IP address is used, then there will be at least two or three IP addresses like - CPU Slot 5 IP address, CPU slot 6 IP address, and the Virtual IP address.

For mgmt address, one would normally use the virtual IP address to access the switch no matter if CPU 5 or CPU 6 is up and running. But ERS 86XX by default does not use virtual IP address while forwarding IPFIX packets. Thus it is wrong to assume that the virtual IP mgmt would always be used even for IPFIX flows.

This problem can be resolved:

- By adding two IP addresses via IPFM to cover both CPU 5 and CPU 6 out-of-band IP addresses.
- In virtual mgmt IP configuration, enable the related parameter which will allow ERS 86XX to use the virtual IP address in order to forward IPFIX packets to IPFM. Then IPFIX packets will be sent by ERS86XX using the virtual IP address. The command to allow virtual mgmt IP address to be used is as follows:

```
ERS8600-1:6/config/sys/set# udpsrc-by-vip enable
```

6.4.5 No flow data is received when VLAN / Management IP address is used in IPFM (for ERS 8600 only)

An ERS 8600 device may be configured to have a VLAN IP together with a Management IP. (To see all existing interfaces, execute CLI command: "show ip inter".)

- If a management port is configured on the ERS 8600 CPU card and has a valid route to the IP Flow Manager, use the IP address of the Management port when you add the ERS 8600 to the devices table in the IP Flow Manager Dashboard.
- If a management port is not configured or does not have a valid route to the IP Flow Manager, use a VLAN IP address of your choice as the IP address when you add

6.4.6 "OutOfMemoryError" exception is logged in Collector log file and IPFM stops processing new flow data

IPFM periodically (every 2 hours) keeps on purging old traffic data. By default IPFM processes all incoming packets even when it purges old traffic data. During this purging cycle MySQL database engine internally stores all the new data until the data cleanup process completes. In case of low-end hardware configuration where enough Memory is not available, or in case of higher incoming traffic rate the data cleanup process takes longer time to complete and MySQL can not ensure enough memory to keep on storing new incoming traffic data. This ultimately generates an "OutOfMemoryError" exception forcing IPFM Collector service to stop processing new packet any further.

- User must ensure higher Memory (RAM) to the server where IPFM is installed.
- Stop Collector service and change the following configuration parameter to true and restart Collector service

```
collector.skip.packets.during.dbcleanup = true
```

The above configuration parameter can be found in {UCM_HOME} \IPFM\ipfix_collector\etc\IPFMCollectorConfiguration.properties file.

You can also reduce the data retention time (e.g. 48 hours) by modifying

```
collector.data.retention.interval parameter in the same file.
```

6.4.7 How to enable Packet Sampling in case IPFM can not meet the speed (traffic burst) of the Flow exporter?

Since IPFM needs to handle a heavy volume of constant traffic data, it is always recommended to be installed in a server with high-end configuration. In case user does not have a high-end server configuration and/or there is extremely high volume of incoming traffic (traffic burst) IPFM will not be able to process incoming data efficiently.

This can lead to an "OutOfMemoryError" exception forcing IPFM Collector service to stop processing new packet any further and/or extremely slow user experience with IPFM.

- Stop Collector service and change the following configuration parameter to a high value (like 30, 50, 70, etc)

```
sample.rate = 40 and then restart Collector service.
```

The above configuration parameter can be found in {UCM_HOME}\IPFM\ipfix_collector\etc\IPFMCollectorConfiguration.properties file.

You can also reduce the data retention time (e.g. 48 hours) by modifying the

```
"collector.data.retention.interval" parameter in the same file.
```

Note:

Packet sampling schemes use randomness in the sampling process to prevent synchronization with a periodic patterns in the traffic. This actually means: on average, 1 in every N packet is captured and analyzed to characterize network traffic. Packet sampling methods such as Cisco's NetFlow are widely employed by large networks to reduce the amount of traffic data measured. The main drawback of packet sampling is that it is inherently a lossy process, discarding

(potentially useful) information. While this type of packet sampling does not provide a 100% accurate result, it does provide a result with quantifiable accuracy.

6.4.8 With multiple Top 10 views opened, views get messed up while rendering

This mostly happens when user opens multiple "Top 10 Views" and/or after a long inactive period moves from one view/tab to another. (This is an open issue with ExtJS JavaScript library (1.1) which is fixed in its later version.)

- In Firefox, resizes the browser (even with slightest resize) and the issue will be resolved.
- Make a right-mouse click against the specific tree-node for which this issue is observed and then click on the "**Reload View**" popup menu. Generally in the machines with standard memory configuration, this issue is not frequently observed.

6.5 General Recommendations

- For any reason if user **restarts UCM JBoss Service**, he/she **must restart IPFM Collector Service** since IPFM Collector Service uses/depends on JMS notification hosted by JBoss.
- For any reason if user **restarts UCM License Service**, installs a new license and/or uninstalls an existing license, he/she **must restart IPFM Collector Service** since IPFM Collector Service loads the license information only during its start-up. So any runtime change in license detail will not be visible until Collector service is restarted. In such scenario user also need to re-login to IPFM UI after the license service is restarted.
- In Internet Explorer browser IPFM runs and is rendered slowly with compared to Firefox browser. Thus user is always **recommended to use Firefox browser** instead of Internet Explorer.

7. Software Baseline

The software levels of Avaya products used for this document is based on the following releases:

1. ERS8600: 5.1.1.1 and 7.0
2. ERS8300: 4.2.1
3. ERS5000: 6.1.0
4. ERS4500: 5.4

8. Reference Documentation

Document Title	Publication Number	Description
ERS8600		
Performance Management	NN46205-704	
Commands Reference — CLI	NN46205-105	
Commands Reference — NNCLI	NN46205-106	
ERS8300		
Performance Management	NN46200-705	
Commands Reference — CLI	NN46200-105	
Commands Reference — NNCLI	NN46200-104	
ERS5000		
Configuration — System Monitoring	NN47200-505	
ERS4500		
Configuration — System Monitoring	NN47205-502	
IPFM		
IP Flow Manager Fundamentals	NN48015-100	

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