



# Encrypted Traffic Analytics

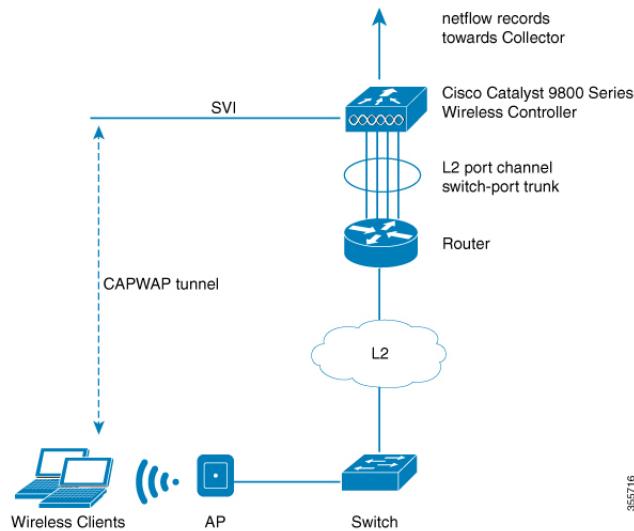
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## Information About Encrypted Traffic Analytics

The Encrypted Traffic Analytics (ETA) leverages Flexible NetFlow (FNF) technology to export useful information about the flow to the collectors and gain visibility into the network.

Figure 1: Encrypted Traffic Analytics Deployed on Cisco Catalyst 9800 Series Wireless Controller in Local Mode



The wireless clients send data packets to the access point. The packets are then CAPWAP encapsulated and sent to the controller. This means that the actual client data is in the CAPWAP payload. To apply ETA on the client data, you need to strip the CAPWAP header before handing over the packet to the ETA module.

The ETA offers the following advantages:

- Enhanced telemetry based threat analytics.
- Analytics to identify malware.

Starting from Cisco IOS XE Amsterdam 17.1.1s, ETA inspection for IPv6 traffic is supported. ETA inspection for IPv6 traffic is enabled by default and no special configuration is required. This release also supports allowed list of IPv6 traffic, exporting ETA records to IPv4 or IPv6 export destination, exporting records over IPFIX (NetFlow v10), and configuring source interface for ETA exports. The records can be exported to IPv4 or IPv6 NetFlow collector.

## Exporting Records to IPv4 Flow Export Destination

Follow the procedure given below to enable encrypted traffic analytics and configure a flow export destination:

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>et-analytics</b> <b>Example:</b> Device(config)# et-analytics	Enables encrypted traffic analytics.

	Command or Action	Purpose
<b>Step 3</b>	<b>ip flow-export destination</b> <i>ip_address</i> <i>port_number</i> <b>Example:</b> <pre>Device(config-et-analytics)# ip flow-export destination 120.0.0.1 2055</pre>	Configures the NetFlow record export. Here, <i>port_number</i> ranges from 1 to 65535.
<b>Step 4</b>	<b>end</b> <b>Example:</b> <pre>Device(config-et-analytics)# end</pre>	Returns to privileged EXEC mode.

## Exporting Records to IPv6 Flow Export Destination

Follow the procedure given below to enable encrypted traffic analytics and configure an IPv6 flow export destination.

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> <pre>Device# configure terminal</pre>	Enters the global configuration mode.
<b>Step 2</b>	<b>et-analytics</b> <b>Example:</b> <pre>Device(config)# et-analytics</pre>	Enables encrypted traffic analytics.
<b>Step 3</b>	<b>ipv6 flow-export destination</b> <i>ipv6-address</i> <i>port-number</i> <b>Example:</b> <pre>Device(config-et-analytics)# ipv6 flow-export destination 2001:181:181::1 2055</pre>	Specifies netflow record export destination IPv6 address and port.  <b>Note</b> The maximum configurable limit for flow-export destinations is four (both IPv4 and IPv6 combined).
<b>Step 4</b>	<b>exit</b> <b>Example:</b> <pre>Device(config-et-analytics)# exit</pre>	Returns to global configuration mode.

## Exporting Records to IPv4 and IPv6 Destination over IPFIX

This procedure provides efficient bandwidth utilization by allowing variable len fields for smaller data packets and also reduces the overall bandwidth requirements for transmission.

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>et-analytics</b> <b>Example:</b> Device(config)# et-analytics	Enables encrypted traffic analytics.
<b>Step 3</b>	<b>ip flow-export destination <i>ip-address</i> <i>port-number</i> ipfix</b> <b>Example:</b> Device(config-et-analytics)# ip flow-export destination 192.168.19.2 2055 ipfix	Specifies NetFlow record export destination IP address, port and format.
<b>Step 4</b>	<b>ipv6 flow-export destination <i>ipv6-address</i> <i>port-number</i> ipfix</b> <b>Example:</b> Device(config-et-analytics)# ipv6 flow-export destination 2001:181:181::1 2055 ipfix	Specifies NetFlow record export destination IPv6 address, port and format.  IPFIX allows you to collect flow information from network devices that support IPFIX protocol and analyze the traffic flow information by processing it through a netflow analyzer.  <b>Note</b> Maximum configurable limit for flow-export destinations is four (both IPv4 and IPv6 combined).
<b>Step 5</b>	<b>exit</b> <b>Example:</b> Device(config-et-analytics)# exit	Returns to global configuration mode.

## Allowed List of Traffic

You can add an allowed list of ACLs for both IPv4 and IPv6 traffic. Traffic from allowed list is skipped from ETA inspection and records are not generated for the matching traffic.

**Before you begin**

Configure an IPv4 or IPv6 access list.

- IPv4 ACL: **ip access-list standard *acl\_name***

```
Device(config)# ip access-list standard eta-whitelist_ipv4
```

- IPv6 ACL: **ipv6 access-list *acl\_name***

```
Device(config)# ipv6 access-list eta-whitelist_ipv6
```

## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>et-analytics</b> <b>Example:</b> Device(config)# et-analytics	Enables encrypted traffic analytics.
<b>Step 3</b>	<b>whitelist acl <i>acl-name</i></b> <b>Example:</b> Device(config-et-analytics)# whitelist acl eta-whitelist	Configures an allowed list for IPv4 or IPv6.  <b>Note</b> You cannot add both IPv4 and IPv6 client traffic simultaneously to an allowed list, as a single ACL cannot have both IPv4 and IPv6 terms.
<b>Step 4</b>	<b>exit</b> <b>Example:</b> Device(config-et-analytics)# exit	Returns to global configuration mode.
<b>Step 5</b>	<b>sequence <i>sequence-num</i> permit udp any any eq tftp</b> <b>Example:</b> Device(config-ipv6-acl)# sequence 10 permit udp any any eq tftp	(Optional) Configures a sequence number and the access conditions to add any IPv6 TFTP traffic to allowed list.

## Configuring Source Interface for Record Export

## Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>et-analytics</b> <b>Example:</b> Device(config)# et-analytics	Enables encrypted traffic analytics.
<b>Step 3</b>	<b>ip flow-export destination <i>ip-address</i> source-interface <i>interface-name</i> interface-number <b>ipfix</b></b>	Specifies NetFlow record export destination IP address, source interface and format.

	Command or Action	Purpose
	<p><b>Example:</b></p> <pre>Device(config-et-analytics)# ip flow-export destination 192.168.19.2 2055  source-interface loopback0 ipfix</pre>	<p>This allows the ETA export to use the IP address of the specified interface, as against using the IP address of the egress interface as the source address.</p> <p>The source interface is applicable for both IPv4 and IPv6 export destinations.</p> <p><b>Note</b> Only one source interface can be specified and all exports use this source address.</p>
<b>Step 4</b>	<p><b>ipv6 flow-export destination</b> <i>ipv6-address</i>  <b>source-interface</b> <i>interface-name</i>  <i>interface-number</i> <b>ipfix</b></p> <p><b>Example:</b></p> <pre>Device(config-et-analytics)# ipv6 flow-export destination 2001:181:181::1 2055 source-interface Vlan160 ipfix</pre>	Specifies NetFlow record export destination IPv6 address, source interface and format.
<b>Step 5</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Device(config-et-analytics)# exit</pre>	Returns to global configuration mode.

## Configuring Source Interface for Record Export Without IPFIX

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<p><b>configure terminal</b></p> <p><b>Example:</b></p> <pre>Device# configure terminal</pre>	Enters the global configuration mode.
<b>Step 2</b>	<p><b>et-analytics</b></p> <p><b>Example:</b></p> <pre>Device(config)# et-analytics</pre>	Enables encrypted traffic analytics.
<b>Step 3</b>	<p><b>ip flow-export destination</b> <i>ip-address</i>  <b>source-interface</b> <i>interface-name</i>  <i>interface-number</i></p> <p><b>Example:</b></p> <pre>Device(config-et-analytics)# ip flow-export destination 192.168.19.2 2055  source-interface loopback0 ipfix</pre>	Specifies NetFlow record export destination IP address, source interface and format.

	Command or Action	Purpose
<b>Step 4</b>	<p><b>ipv6 flow-export destination</b> <i>ipv6-address</i>  <b>source-interface</b> <i>interface-name</i>  <i>interface-number</i> <b>ipfix</b></p> <p><b>Example:</b></p> <pre>Device(config-et-analytics)# ipv6 flow-export destination 2001:181:181::1 2055 source-interface Vlan160</pre>	Specifies NetFlow record export destination IPv6 address, source interface and format.
<b>Step 5</b>	<p><b>exit</b></p> <p><b>Example:</b></p> <pre>Device(config-et-analytics)# exit</pre>	Returns to global configuration mode.

## Configuring ETA Flow Export Destination (GUI)

### Procedure

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- Step 1** Choose **Configuration > Services > NetFlow**.
- Step 2** Click the **Add** button. The **Create NetFlow** dialog box appears.
- Step 3** Choose any one of the available templates from the **NetFlow Template** drop-down list.
- Step 4** Enter an IPv4 or IPv6 address in the **Collector Address** field.
- Step 5** From the **Whitelist ACL** drop-down list, choose the desired option.
- Note** To use this option, ensure that you select **Encrypted Traffic Analytics** from the **NetFlow Template** drop-down list.
- Step 6** Enter a port number in the **Exporter Port** field. You must specify a value between 1 and 65535.
- Step 7** Choose the desired option from the **Export Interface IP** drop-down list.
- Step 8** Choose any one of the sampling methods from the **Sampling Method** drop-down list. The available options are **Deterministic**, **Random**, and **Full Netflow**.
- Step 9** Enter a range for the sample. You must specify a value between 32 and 1032.
- Step 10** Select the required interfaces/profile from the **Available** pane and move it to the **Selected** pane.
- Step 11** Click the **Save & Apply to Device** button.
- 

## Enabling In-Active Timer

Follow the procedure given below to enable in-active timer:

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>et-analytics</b> <b>Example:</b> Device(config)# et-analytics	Configures the encrypted traffic analytics.
<b>Step 3</b>	<b>inactive-timeout <i>timeout-in-seconds</i></b> <b>Example:</b> Device(config-et-analytics)# inactive-timeout 15	Specifies the inactive flow timeout value.  Here, <i>timeout-in-seconds</i> ranges from 1 to 604800.
<b>Step 4</b>	<b>end</b> <b>Example:</b> Device(config-et-analytics)# end	Returns to privileged EXEC mode. Alternatively, you can also press Ctrl-Z to exit global configuration mode.

## Enabling ETA on WLAN Policy Profile

Follow the procedure given below to enable ETA on WLAN policy profile:

**Procedure**

	<b>Command or Action</b>	<b>Purpose</b>
<b>Step 1</b>	<b>configure terminal</b> <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>wireless profile policy <i>profile-name</i></b> <b>Example:</b> Device(config)# wireless profile policy default-policy-profile	Creates policy profile for the WLAN.  The <i>profile-name</i> is the profile name of the policy profile.
<b>Step 3</b>	<b>et-analytics enable</b> <b>Example:</b> Device(config-wireless-policy)# et-analytics enable	Enables encrypted traffic analytics on the policy.
<b>Step 4</b>	<b>end</b> <b>Example:</b> Device(config-wireless-policy)# end	Returns to privileged EXEC mode. Alternatively, you can also press <b>Ctrl-Z</b> to exit global configuration mode.



## Attaching Policy Profile to VLAN (GUI)

Perform the following steps to attach a policy profile to VLAN.

### Procedure

- 
- Step 1** Check the **RADIUS Profiling** checkbox.
  - Step 2** From the **Local Subscriber Policy Name**, choose the required policy name.
  - Step 3** In the **WLAN Local Profiling** section, enable or disable the **Global State of Device Classification**, check the checkbox for **HTTP TLV Caching** and **DHCL TLV Caching**.
  - Step 4** In the **VLAN** section, choose the **VLAN/VLAN Group** from the drop-down list. Enter the Multicast VLAN.
  - Step 5** In the **WLAN ACL** section, choose the **IPv4 ACL** and **IPv6 ACL** from the drop-down list.
  - Step 6** In the **URL Filters** section, choose the **Pre Auth** and **Post Auth** from the drop-down list.
  - Step 7** Click **Save & Apply to Device**.
- 

## Attaching Policy Profile to VLAN

Follow the procedure given below to attach a policy profile to VLAN:

### Procedure

	Command or Action	Purpose
<b>Step 1</b>	<b>configure terminal</b>  <b>Example:</b> Device# configure terminal	Enters the global configuration mode.
<b>Step 2</b>	<b>wireless profile policy <i>profile-name</i></b>  <b>Example:</b> Device(config)# wireless profile policy default-policy-profile	Creates policy profile for the WLAN.  The <i>profile-name</i> is the profile name of the policy profile.
<b>Step 3</b>	<b>vlan <i>vlan-name</i></b>  <b>Example:</b> Device(config-wireless-policy)# vlan vlan-name	Assigns the policy profile to the VLANs.
<b>Step 4</b>	<b>no shutdown</b>  <b>Example:</b> Device(config-wireless-policy)# no shutdown	Enables the wireless policy profile.

# Verifying ETA Configuration

## Verifying ETA Globally

To view the ETA global and interface details, use the following command:

```
Device# show platform software utd chassis active F0 et-analytics global

ET Analytics Global Configuration
ID: 1
All Interfaces: Off
IP address and port and vrf: 192.168.5.2:2055:0
```

To view the ETA global configuration, use the following command:

```
Device# show platform software et-analytics global

ET-Analytics Global state
=====
All Interfaces      : Off
IP Flow-record Destination: 192.168.5.2 : 2055
Inactive timer: 15
```




---

**Note** The `show platform software et-analytics global` command does not display the ETA enabled wireless client interfaces.

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To view the ETA global state in datapath, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath runtime

ET-Analytics run-time information:

Feature state: initialized (0x00000004)
Inactive timeout      : 15 secs (default 15 secs)
WhiteList information :
  flag: False
  cgacl w0 : n/a
  cgacl w1 : n/a
Flow CFG information  :
  instance ID        : 0x0
  feature ID         : 0x1
  feature object ID  : 0x1
  chunk ID          : 0xC
```

To view the ETA memory details, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath memory

ET-Analytics memory information:

Size of FO           : 3200 bytes
No. of FO allocs     : 0
No. of FO frees      : 0
```

To view the ETA flow export in datapath, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath stats export

ET-Analytics 192.168.5.2:2055 vrf 0 Stats:
```

```

Export statistics:
  Total records exported      : 5179231
  Total packets exported     : 3124873
  Total bytes exported       : 3783900196
  Total dropped records      : 0
  Total dropped packets      : 0
  Total dropped bytes        : 0
  Total IDP records exported :
    initiator->responder     : 1285146
    responder->initiator     : 979284
  Total SPLT records exported:
    initiator->responder     : 1285146
    responder->initiator     : 979284
  Total SALT records exported:
    initiator->responder     : 0
    responder->initiator     : 0
  Total BD records exported  :
    initiator->responder     : 0
    responder->initiator     : 0
  Total TLS records exported :
    initiator->responder     : 309937
    responder->initiator     : 329469

```

To view the ETA flow statistics, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath stats flow
```

```

ET-Analytics Stats:
  Flow statistics:
    feature object allocs : 0
    feature object frees  : 0
    flow create requests  : 0
    flow create matching  : 0
    flow create successful: 0
    flow create failed, CFT handle: 0
    flow create failed, getting FO: 0
    flow create failed, malloc FO : 0
    flow create failed, attach FO : 0
    flow create failed, match flow: 0
    flow create, aging already set: 0
    flow ageout requests   : 0
    flow ageout failed, freeing FO: 0
    flow ipv4 ageout requests : 0
    flow ipv6 ageout requests : 0
    flow whitelist traffic match : 0

```

### Verifying ETA on Wireless Client Interface

To view if a policy is configured with ETA, use the following command:

```
Device# show wireless profile policy detailed default-policy-profile
```

```

Policy Profile Name      : default-policy-profile
Description              : default policy profile
Status                  : ENABLED
VLAN                    : 160
Multicast VLAN          : 0
Passive Client          : DISABLED
ET-Analytics            : DISABLED
StaticIP Mobility       : DISABLED
WLAN Switching Policy
  Central Switching     : ENABLED
  Central Authentication : ENABLED
  Central DHCP          : ENABLED

```

```
Flex NAT PAT          : DISABLED
Central Assoc         : ENABLED
```

To view the ETA status in the wireless client detail, use the following command:

```
Device# show platform hardware chassis active qfp feature wireless wlclient datapath
<client_mac>
```

```
Wlclient Details for Client mac: 0026.c635.ebf8
```

```
-----
Input VlanId      : 160
Point of Presence : 0
Wlclient Input flags : 9
Instance ID      : 3
ETA enabled       : True
client_mac_addr   : 0026.c635.ebf8

bssid_mac_addr: 58ac.7843.037f
Point of Attachment : 65497
Output vlanId    : 160
wlan_output_uidb : -1
Wlclient Output flags : 9
Radio ID         : 1
cgacl w0         : 0x0
cgacl w1         : 0x0
IPv6 addr number : 0
IPv6 addr learning : 0
```

To view clients in the ETA pending wireless client tree, use the following command:

```
Device# show platform hardware chassis active qfp feature wireless et-analytics
eta-pending-client-tree
```

CPP	IF_H	DPIDX	MAC Address	VLAN	AS	MS WLAN	POA
0X2A	0XA0000001	2c33.7a5b.827b	160	RN	LC xyz_ssid	0x90000003	
0X2B	0XA0000002	2c33.7a5b.80fb	160	RN	LC xyz_ssid	0x90000003	

To view the QFP interface handle, use the following command:

```
Device#
show platform hardware chassis active qfp interface if-handle <qfp_interface_handle>
```

```
show platform hardware chassis active qfp interface if-handle 0X29
FIA handle - CP:0x27f3ce8 DP:0xd7142000
LAYER2_IPV4_INPUT_ARL_SANITY
WLCLIENT_INGRESS_IPV4_FWD
IPV4_TVI_INPUT_FIA >>> ETA FIA Enabled
SWPORT_VLAN_BRIDGING
IPV4_INPUT_GOTO_OUTPUT_FEATURE (M)
Protocol 1 - ipv4_output
FIA handle - CP:0x27f3d30 DP:0xd7141780
IPV4_VFR_REFRAG (M)
IPV4_TVI_OUTPUT_FIA >>> ETA FIA Enabled
WLCLIENT_EGRESS_IPV4_FWD
IPV4_OUTPUT_DROP_POLICY (M)
DEF_IF_DROP_FIA (M)
```



**Note** The `qfp_interface_handle` ranges from 1 to 4294967295.

To view the ETA pending wireless client tree statistics, use the following command:

```
Device# show platform hardware chassis active qfp feature wireless et-analytics statistics
```

```
Wireless ETA cpp-client plumbing statistics
```

```
Number of ETA pending clients : 2
```

```
Counter Value
```

```
-----
Enable ETA on wireless client called      0
Delete ETA on wireless client called      0
ETA global cfg init cb TVI FIA enable error 0
ETA global cfg init cb output SB read error 0
ETA global cfg init cb output SB write error 0
ETA global cfg init cb input SB read error 0
ETA global cfg init cb input SB write error 0
ETA global cfg init cb TVI FIA enable success 0
ETA global cfg uninit cb ingress feat disable 0
ETA global cfg uninit cb ingress cfg delete e 0
ETA global cfg uninit cb egress feat disable 0
ETA global cfg uninit cb egress cfg delete er 0
ETA pending list insert entry called      4
ETA pending list insert invalid arg error 0
ETA pending list insert entry exists error 0
ETA pending list insert no memory error 0
ETA pending list insert entry failed      0
ETA pending list insert entry success     4
ETA pending list delete entry called      2
ETA pending list delete invalid arg error 0
ETA pending list delete entry missing     0
ETA pending list delete entry remove error 0
ETA pending list delete entry success     2
```

To view the allowed list configuration, use the following commands:

```
Device# show platform software et-analytics global
```

```
ET-Analytics Global state
```

```
=====
```

```
All Interfaces      : Off
IP Flow-record Destination: 192.168.5.2 : 2055
Inactive timer: 15
whitelist acl eta-whitelist
```

```
Device# show platform hardware chassis active qfp feature et-analytics datapath runtime
```

```
ET-Analytics run-time information:
```

```
Feature state: initialized (0x00000004)
Inactive timeout      : 15 secs (default 15 secs)
```

```
WhiteList information :
```

```
flag: True
cgacl w0 : 0xd9ae9c80
cgacl w1 : 0x20000000
```

```
Flow CFG information :
instance ID      : 0x0
feature ID       : 0x0
feature object ID : 0x0
chunk ID        : 0x4
```

To view the ETA export statistics, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath stats export
```

```
ET-Analytics Stats:
```

```
Export statistics:
Total records exported      : 5179231
Total packets exported     : 3124873
Total bytes exported       : 3783900196
```

```

Total dropped records      : 0
Total dropped packets     : 0
Total dropped bytes       : 0
Total IDP records exported :
    initiator->responder : 1285146
    responder->initiator : 979284
Total SPLT records exported:
    initiator->responder : 1285146
    responder->initiator : 979284
Total SALT records exported:
    initiator->responder : 0
    responder->initiator : 0
Total BD records exported :
    initiator->responder : 0
    responder->initiator : 0
Total TLS records exported :
    initiator->responder : 309937
    responder->initiator : 329469

```

To view the ETA flow statistics, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath stats flow
```

```

ET-Analytics Stats:
  Flow statistics:
    feature object allocs : 0
    feature object frees  : 0
    flow create requests  : 0
    flow create matching  : 0
    flow create successful: 0
    flow create failed, CFT handle: 0
    flow create failed, getting FO: 0
    flow create failed, malloc FO : 0
    flow create failed, attach FO : 0
    flow create failed, match flow: 0
    flow create, aging already set: 0
    flow ageout requests   : 0
    flow ageout failed, freeing FO: 0
    flow ipv4 ageout requests : 0
    flow ipv6 ageout requests : 0
    flow whitelist traffic match : 0

```

To view the ETA datapath runtime detail, use the following command:

```
Device# show platform hardware chassis active qfp feature et-analytics datapath runtime
```

```

ET-Analytics run-time information:
  Feature state      : initialized (0x00000004)
  Inactive timeout   : 15 secs (default 15 secs)
  WhiteList information :
    flag             : True
    cgacl w0         : 0xd9ae1e10
    cgacl w1         : 0x20000000
  Flow CFG information :
    instance ID      : 0x0
    feature ID        : 0x0
    feature object ID : 0x0
    chunk ID          : 0x4

```