CHAPTER 2

Cisco AVC Metric Definitions

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This chapter contains the following sections:

NBAR2 Metrics

Next Generation Network-Based Application Recognition (NBAR2) metrics are the metrics and application information with the latest protocol pack that comes with the number of applications supported.

Field IDs represent the fields in a record. The format of the record consists of the order of the fields, which is communicated to the NetFlow template.

Table 2-1 lists the NBAR2 metric summary.

Table 2-1 NBAR2 Metrics Summary

Field Name	Field ID (IOS)	Field ID (IOS XE)
NBAR2 Application ID	95	95
HTTP Host	45003	45003
URI Statistics (Hit Count)	42125	—
Extracted Fields	—	45003

For information about HTTP proxy, see the "HTTP Proxy" section on page 2-8. For information about the Cisco IOS-XE-specific extracted fields, see the *Cisco Application Visibility and Control User Guide*.

NBAR2 Application ID

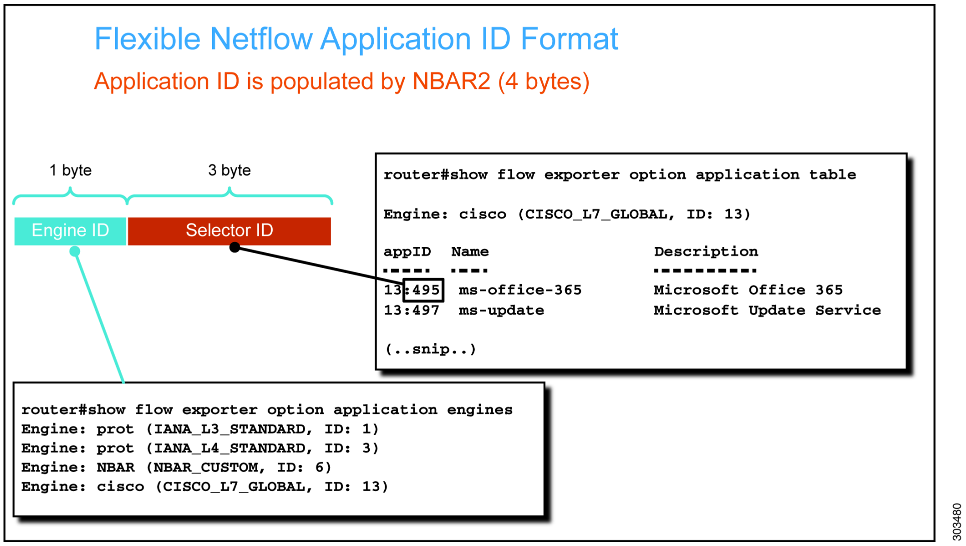
The following table lists information about the NBAR2 application ID metric.

Table 2-2 Information About NBAR2 Application ID Metric

Description	Provides the Layer 7-level information for a particular flow.
CLI	**Cisco IOS and Cisco IOS XE:** **collect application name**
Export Field ID	**Cisco IOS and Cisco IOS XE:** 95
Export Protocol	NetFlow v9, IPFIX

Figure 2-1 illustrates the Flexible NetFlow Application ID format.

Figure 2-1 Flexible NetFlow Application ID Format


Flexible Netflow Application ID Format
Application ID is populated by NBAR2 (4 bytes)
1 byte
3 byte
Engine ID
Selector ID
303480

```
router#show flow exporter option application table

Engine: cisco (CISCO_L7_GLOBAL, ID: 13)

appID   Name                    Description
-----   ----                    -----------
13:495  ms-office-365           Microsoft Office 365
13:497  ms-update               Microsoft Update Service

(..snip..)
```

```
router#show flow exporter option application engines
Engine: prot (IANA_L3_STANDARD, ID: 1)
Engine: prot (IANA_L4_STANDARD, ID: 3)
Engine: NBAR (NBAR_CUSTOM, ID: 6)
Engine: cisco (CISCO_L7_GLOBAL, ID: 13)
```

An ID exported by AVC explains which application a particular flow belongs to. Figure 2-1 shows that the Application ID is divided into two parts:

- Engine ID— A unique identifier for the engine that determined the Selector ID. The Classification Engine ID defines the context for the Selector ID. The Engine ID is the first eight bits that provide information about the engine that classifies the flow. IANA-L4, CANA-L3, and so on, are some of the engines that can be classified using an engine ID. Note that the Engine ID does not represent the NBAR2 mechanism used to classify the application. For more information about the engine IDs, see the information available here: http://tools.ietf.org/html/rfc6759
- Selector ID—The remaining 24 bits that provide information about the application. 495(MS office) is one of the applications that can be classified using the classification ID.

The **collect application name** command exports only the application ID, which is a number that may not be understood by a collector. To export a mapping table between an application ID to application name and description, use the **option application-table** command in flow exporter configuration.

Example:

```
flow exporter my-exporter
   option application-table
```

The following example shows the output of the **show flow exporter option application table** command:

```
avc-2901a#show flow exporter option application table

Engine: prot (IANA_L3_STANDARD, ID: 1)

appID  Name                      Description
-----  ----                      -----------
1:8    egp                       Exterior Gateway Protocol
1:47   gre                       General Routing Encapsulation
1:1    icmp                      Internet Control Message Protocol
1:88   eigrp                     Enhanced Interior Gateway Routing Protocol
1:4    ipinip                    IP in IP
1:89   ospf                      Open Shortest Path First
1:46   rsvp                      Resource Reservation Protocol
1:0    hopopt                    DEPRECATED, traffic will not match
1:3    ggp                       Gateway-to-Gateway
1:5    st                        Stream
1:7    cbt                       CBT
1:9    igrp                      Cisco interior gateway
1:10   bbnrccmon                 BBN RCC Monitoring
1:11   nvp-ii                    Network Voice Protocol
1:12   pup                       PUP


Engine: NBAR (NBAR_CUSTOM, ID: 6)

appID  Name                      Description
-----  ----                      -----------
6:244  custom-10                 Custom protocol custom-10
6:245  custom-09                 Custom protocol custom-09
6:246  custom-08                 Custom protocol custom-08
6:247  custom-07                 Custom protocol custom-07
6:248  custom-06                 Custom protocol custom-06
6:249  custom-05                 Custom protocol custom-05
6:250  custom-04                 Custom protocol custom-04
6:251  custom-03                 Custom protocol custom-03
6:252  custom-02                 Custom protocol custom-02
6:253  custom-01                 Custom protocol custom-01


Engine: cisco (CISCO_L7_GLOBAL, ID: 13)

appID  Name                      Description
-----  ----                      -----------
13:0    unclassified              Unclassified traffic
13:1    unknown                   Unknown application
13:9    ipsec                     IPSec traffic
13:12   cuseeme                   CU-SeeMe desktop video conference
13:13   dhcp                      Dynamic Host Configuration Protocol
13:26   netbios                   netbios
13:2000  notes                     DEPRECATED, traffic will not match. Please use lotus-no
13:32   pcanywhere                Symantec pcAnywhere remote desktop
13:41   syslog                    System Logging Utility
13:47   novadigm                  Novadigm EDM
13:49   exchange                  MS-RPC Exchange
13:425  vdolive                   VDOLive streaming video
13:426  netshow                   Microsoft Netshow, media streaming protocol
13:427  streamwork                Xing Technology StreamWorks player
```

```
13:56   citrix                   Citrix Systems Metaframe 3.0
13:57   fasttrack                DEPRECATED, traffic will not match
13:58   gnutella                 Gnutella Version2 Traffic, peer-to-peer file-sharing pr
13:59   kazaa2                   DEPRECATED, traffic will not match
13:61   rtp                      Real Time Protocol
13:62   mgcp                     Media Gateway Control Protocol
13:63   skinny                   Skinny Call Control Protocol
```

The following example shows an application-table option. Note that the format of the record is the same for all the export formats, but the Field IDs differ based on the export format protocol. Use **show flow exporter <exporter_name> templates** command to see the format output.

```
Exporter Format: IPFIX (Version 10)
  Template ID    : 259
  Record Size    : 83
  Template layout
  -----------------------------------------------------------------------------
  |                 Field                     |    ID | Ent.ID | Offset |  Size |
  -----------------------------------------------------------------------------
  | APPLICATION ID                            |    95 |        |      0 |     4 |
  | application name                          |    96 |        |      4 |    24 |
  | application description                   |    94 |        |     28 |    55 |
  -----------------------------------------------------------------------------
```

For more information about various attributes of a particular application, use the **option application-attributes** command in configuration mode.

```
Exporter Format: IPFIX (Version 10)
  Template ID    : 260
  Record Size    : 130
  Template layout
  _____________________________________________________________________________
  |                 Field                     |    ID | Ent.ID | Offset |  Size |
  -----------------------------------------------------------------------------
  | APPLICATION ID                            |    95 |        |      0 |     4 |
  | application category name                | 45000 |      9 |      4 |    32 |
  | application sub category name            | 45001 |      9 |     36 |    32 |
  | application group name                   | 45002 |      9 |     68 |    32 |
  | p2p technology                            |   288 |        |    100 |    10 |
  | tunnel technology                         |   289 |        |    110 |    10 |
  | encrypted technology                      |   290 |        |    120 |    10 |
  -----------------------------------------------------------------------------
```

The output of the **option** command in the periodic export of NBAR are sent to the collector for each protocol. The following are the different types of application attributes:

- Category—Provides the first-level categorization for each application.
- Sub-Category—Provides the second-level categorization for each application.
- Application-Group—Identifies the group application that belongs to the same networking application.
- P2P Technology—Specifies whether an application is based on peer-to-peer technology.
- Tunnel Technology—Specifies whether an application tunnels the traffic of other protocols.
- Encrypted—Specifies whether an application is an encrypted networking protocol.

The following example shows how the data looks in an export format:

```
#259: APPLICATION_NAME:13:1 CATEGORY:other APP_SUB_CATEGORY:other APP_GROUP:other
P2P_TECHNOLOGY:unassigned TUNNEL:unassigned ENCRYPTED:unassigned

 #259: APPLICATION_NAME:3:21 CATEGORY:file-sharing APP_SUB_CATEGORY:client-server
APP_GROUP:ftp-group P2P_TECHNOLOGY:no TUNNEL:no ENCRYPTED:no

 #259: APPLICATION_NAME:3:80 CATEGORY:browsing APP_SUB_CATEGORY:other APP_GROUP:other
P2P_TECHNOLOGY:no TUNNEL:no ENCRYPTED:no

 #259: APPLICATION_NAME:1:8 CATEGORY:net-admin APP_SUB_CATEGORY:routing-protocol
APP_GROUP:other P2P_TECHNOLOGY:no TUNNEL:no ENCRYPTED:no

 #259: APPLICATION_NAME:1:47 CATEGORY:layer3-over-ip APP_SUB_CATEGORY:other
APP_GROUP:other P2P_TECHNOLOGY:unassigned TUNNEL:unassigned ENCRYPTED:unassigned

 #259: APPLICATION_NAME:1:1 CATEGORY:net-admin APP_SUB_CATEGORY:network-management
APP_GROUP:other P2P_TECHNOLOGY:no TUNNEL:no ENCRYPTED:no

 #259: APPLICATION_NAME:1:88 CATEGORY:net-admin APP_SUB_CATEGORY:routing-protocol
APP_GROUP:other P2P_TECHNOLOGY:no TUNNEL:no ENCRYPTED:no

 #259: APPLICATION_NAME:1:4 CATEGORY:layer3-over-ip APP_SUB_CATEGORY:other APP_GROUP:other
P2P_TECHNOLOGY:no TUNNEL:yes ENCRYPTED:no

 #259: APPLICATION_NAME:13:9 CATEGORY:internet-privacy
APP_SUB_CATEGORY:tunneling-protocols APP_GROUP:ipsec-group P2P_TECHNOLOGY:no TUNNEL:yes
ENCRYPTED:yes

 #259: APPLICATION_NAME:1:89 CATEGORY:net-admin APP_SUB_CATEGORY:routing-protocol
APP_GROUP:other P2P_TECHNOLOGY:no TUNNEL:no ENCRYPTED:no
```

NBAR2 HTTP Fields

AVC supports the following NBAR2-related fields in Cisco IOS Release 15.2(4)M2, Cisco IOS XE Release 3.9S, and later releases:

- HTTP Host, page 2-5
- URI Statistics, page 2-7

HTTP Host

Table 2-3 lists information about HTTP host metric:

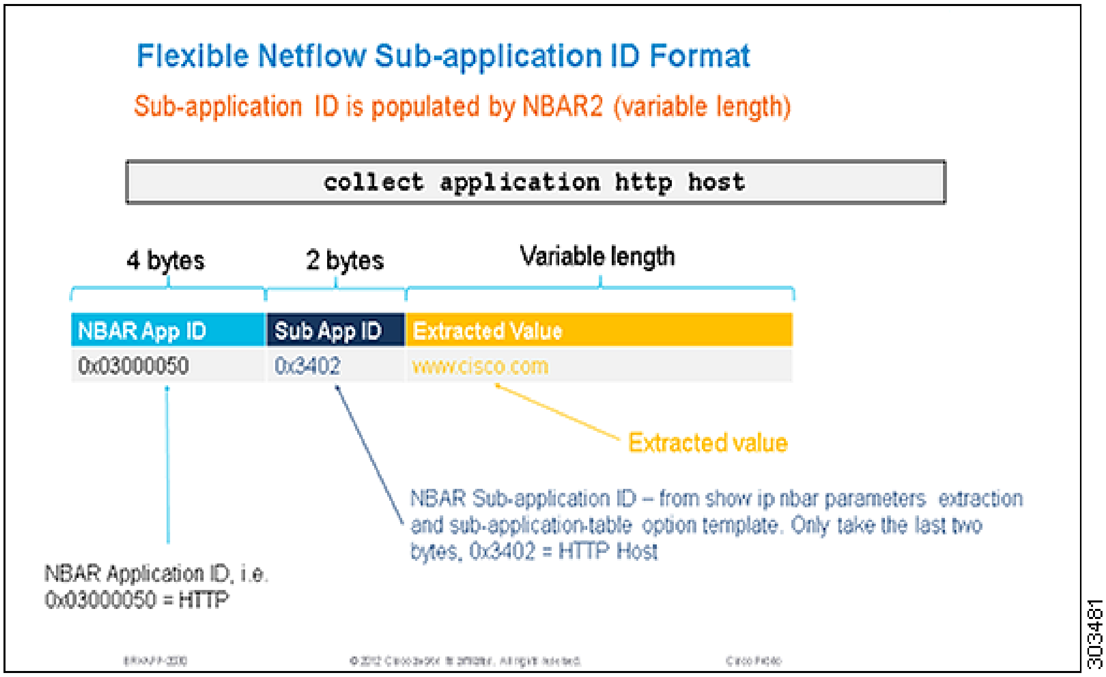
Table 2-3 HTTP Host Metric

Definition	Determines the host name of the flow.
CLI	**IOS and IOS XE:** **collect application http host**
Export Field ID	**IOS and IOS XE:** 45003
Export Protocol	IPFIX

One hostname is exported per flow record.

Figure 2-2 shows the Flexible NetFlow Subapplication ID format.

Figure 2-2 Flexible NetFlow Sub-Application ID Format



Flexible Netflow Sub-application ID Format

Sub-application ID is populated by NBAR2 (variable length)

```
collect application http host
```

4 bytes	2 bytes	Variable length
NBAR App ID	Sub App ID	Extracted Value
0x03000050	0x3402	www.cisco.com

Extracted value

NBAR Sub-application ID – from show ip nbar parameters extraction and sub-application-table option template. Only take the last two bytes. 0x3402 = HTTP Host

NBAR Application ID, i.e. 0x03000050 = HTTP

The following example shows how the information is exported for HTTP host metric.

URL: http://www.cisco.com/go/avc

The host in this example is *www.cisco.com*.

The following is a list of the various characteristics of the HTTP Host metric:

- The collector identifies the extracted field name and type based on the Application ID and Subapplication ID that are embedded in it. For an HTTP Host, the Application ID is generally 0x03000050. The first byte specifies the Engine ID and the following three bytes are for the Selector ID. The Subapplication ID for the host is 0x3402. The value is the host string, as shown in the following example:

  Application ID: 0x03000050

  Engine ID: IANA-L4

  Selector ID: decimal 80 for HTTP

  Sub-application ID: 0x3402

  Value: www.cisco.com
- The host is collected only when it is configured. It is an independent field and is not related to URI field.
- In IOS platform, P is exported as hostname if HTTP proxy is used.
- If the flow is terminated during the export interval, both the URI and hostname fields will be exported.
- In IOS platform, the maximum length of a hostname is 512 characters long. If a hostname exceeds 512 characters, it will be truncated to 512 bytes and the trailing characters will be dropped. In IOS XE, all extracted fields are variable length fields with a limit of 2KB.
- Multiple transactions are not supported for a host extraction on IOS.

- If the HTTP host is configured for a non-HTTP flow, this field will be exported with no value or zero value size. Microsoft exchange and Telnet are two examples for non-HTTP flows.

URI Statistics

Table 2-4 lists information about URI statistics.

Table 2-4 URI Statistics

Description	Collects and exports the URI and URI hit counts.
CLI	**IOS and IOS XE:** **collect application http uri statistics**
Export Field ID	**IOS and IOS XE:** 42125
Export Protocol	IPFIX

On XE platform, the URI hits can be configured when the keys used are "match connection id" or "match connection transaction-id". Therefore only one URI is reported with hits=1.

URI and URI hit count are collected and exported using the following format:

uri <delimiter> count <delimiter> uri <delimiter> count <delimiter>...

NULL (\0) is the delimiter. Count is a 2-byte value and is encoded as an integer, while URI is encoded as a string.

Note The collected and exported URI is limited to the first '/'. For example, if the URL is http://www.cisco.com/router/isr/g2, the URI collected is '/router'.

A pattern is used to export the list of URIs and the corresponding hit counts. For example, if we have the following flows during the 5-minute window (src-ip 1.1.1.1, dest-ip 2.2.2.2. des-port80, protocol TCP):

- www.yahoo.com/music (5 flows)
- www.yahoo.com/video (3 flows)
- www.yahoo.com/data (10 flows)

The result will be exported as: 1.1.1.1, 2.2.2.2, 80, TCP, www.yahoo.com, /music:5/video:3/data:10.

The following are the various characteristics of a URI metric and a URI statistic metric:

- If the **collect app http host** command is configured in the flow record, the hostname www.yahoo.com will be exported.
- The delimiter is NULL (\0) URI, and the count is always represented in binary format using fixed length or 2 bytes. The delimiters colon (:) and double colon (::) are used here for demonstration purposes.
- The collector parses the URI through the basis of delimiters.
- A FNF export field (42125) is used to export the list of URIs and the corresponding hit counts. The Encoding will be done as follows:

  {URI\0countURI\0count}

NULL terminated string, followed by 2-byte hit count and so on. For example: [music\05video\03data\010].

- Multiple transactions are not supported for host extraction. If there are multiple transactions in the same TCP connection, NBAR will provide host information from only the first transaction.
- If the flow is terminated in this export interval, both the URI and hostname fields will be exported.
- The maximum length of one URI instance is 512 characters long. If a URI name exceeds 512 characters, it will be truncated to 512 bytes and trailing characters will be dropped and will not be exported.
- The URI hit count is a 2-byte variable. The maximum URI hit count is 65,535.
- If the HTTP URI statistic is configured for non-HTTP flows, this field will be exported as NULL.
- If there are multiple transactions in the same TCP connection, NBAR will provide URI information from only the first transaction. Multi-transaction scenario is not supported for URI extraction.
- AVC on IOS supports tunneled protocol.
- AVC on IOS provides hit count for NULL URIs.
- All the parameters appearing after “?” in the URI will be stripped off and not exported. For example, if the URI is “path?h:test”, the URI that is exported will be “path” only; “h:test” will be stripped off.
- If the URI is index.html, it will be exported as a separate URI and will not be aggregated with first-level " " URI hit count.

HTTP Proxy

In case of HTTP Proxy, the hostname will be a part of the URI. For example, if the browser URL is ‘http://www.cisco.com/go/avc’, and if there is *no* HTTP proxy, the output will be:

Hostname: www.cisco.com

URI: ‘go’ [first-level URI]

If HTTP proxy is present, the NBAR output will be:

Host Name: www.cisco.com

URI: http://www.cisco.com/go [Hostname is part of the URI, and the URI is at first-level only. In this case, it is ‘go’]

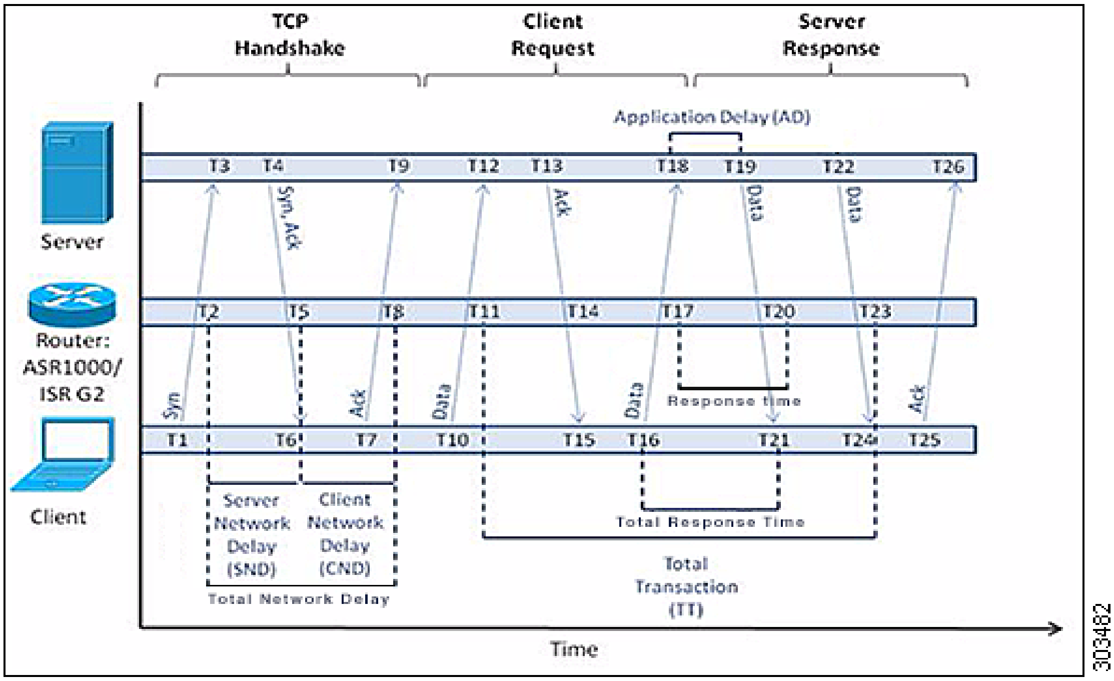
If HTTP proxy is not present, there will be one host name per 4-tuple flow. The hostname will be exported. For example, the hostname will be ‘www.cisco.com’ and URI will be ‘go’.

Application Response Time Metrics

Application Response Time (ART) metrics are metrics extracted or calculated by the ART engine. These metrics are available only for TCP flows. ART client/server bytes and packets are for Layer 3 and Layer 4 measurements.

Figure 2-3 illustrates the TCP performance in the context of different types of delay and response time.

Figure 2-3 CP Diagram for Application Response Time Metrics



Some of the metrics are available only after certain protocol stages:

- Network time-related metrics are exported only after the TCP three-way handshake.
- Transaction time is measured and exported upon receiving either a new request from a client (which indicates the end of a current transaction) or the first FIN packet.
- Response time is measured and exported only after receiving the first response from the server.

In addition, the collector might occasionally observe zero values for TCP performance metric's active flows. Possible reasons are:

- The value of the metrics is zero according to the derived metrics calculation formula.
- Some delay metric could be less than 1 millisecond, which is the smallest granularity supported in TCP performance.

From the exported TCP Performance metrics, more metrics can be derived at the collector side.

Example:

Average Application Delay (AD) = Connection Delay Application Sum/ Connection Counter Server Responses

Table 2-5 lists the ART metrics summary.

Table 2-5 ART Metrics Summary

Field Name	Field ID (IOS and IOS XE)

Client Network Time [sum/min/max]	42084(sum)
	42085(max)
	42086(min)

Long Lived Client Network Time [sum/min/max/num-samples]	42023(sum)
	40285(max)
	40286(min)
	42027(num-samples)

Server Network Time [sum/min/max]	42087(sum)
	42088(max)
	42089(min)

Long Lived Server Network Time [sum/min/max/num-samples]	42022(sum)
	40288(max)
	40289(min)
	42026(num-samples)

Network Time [sum/min/max]	42081(sum)
	42082(max)
	42083(min)

Long Lived Network Time [sum/min/max/num-samples]	42024(sum)
	42082(max)
	42083(min)
	42025(num-samples)

Server Response Time [sum/min/max]	42074(sum)
	42075(max)
	42076(min)

Response Time [sum/min/max]	42071(sum)
	42072(max)
	42073(min)

Total Response Time [sum/min/max]	42077(sum)
	42078(max)
	42079(min)

Total Transaction Time [sum/min/max]	42041(sum)
	42042(max)
	42043(min)

Table 2-5 ART Metrics Summary (continued)

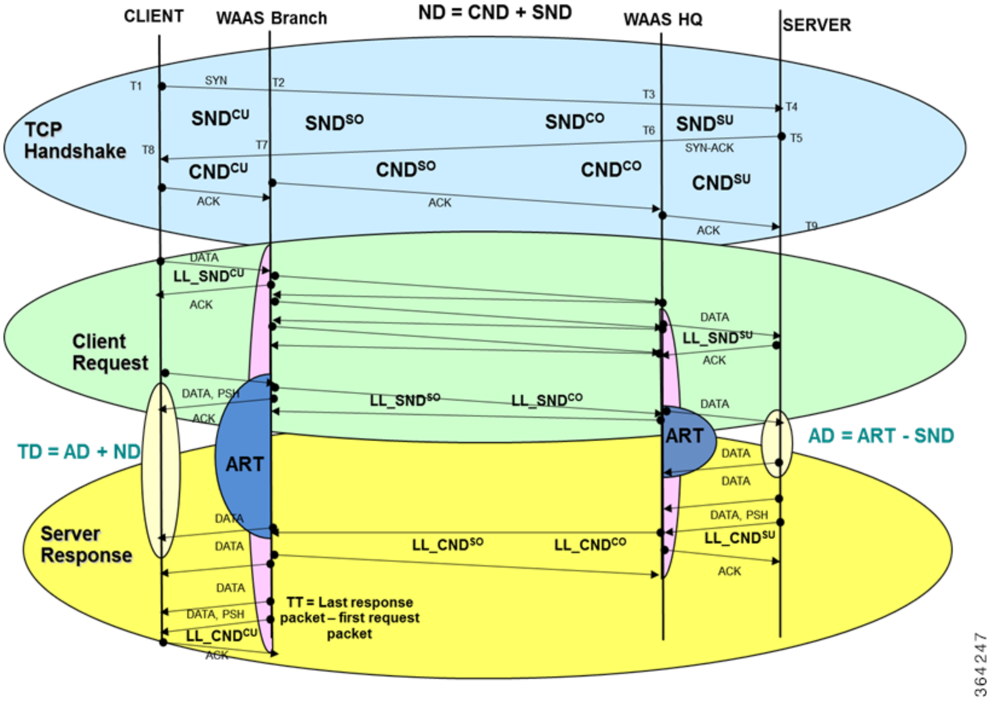
Field Name	Field ID (IOS and IOS XE)

ART Client Bytes/Packets(Layer 4)	231(octets)
	298(packets)

ART Server Bytes/Packet(Layer 4)	232(octets)
	299(packets)

ART Count New Connections	278
ART Concurrent Sessions	42018
ART Count Responses	42060
Responses Histogram Buckets (7-Bucket Histogram)	42061–42067
ART Count Late Responses	42068
ART Count Transactions	42040
ART Client Retransmissions Bytes	42035
ART Client Retransmissions Packets	42036
ART Server Retransmissions Bytes	42037
ART Server Retransmissions Packets	42038
ART Client Bytes(Layer 3)	41106 (octets)
ART Server Bytes(Layer 3)	41105 (octets)

Figure 2-4 Segment Diagram for Application Response Time Metrics



Client Network Time [sum/min/max]

Table 2-6 lists information about the Client Network Time metric.

Table 2-6 Client Network Time Metric

Description	Round trip between SYN-ACK and ACK. It is also called *Client Network Delay* (CND).
CLI	**IOS and IOS XE:** **collect connection delay network to-client sum** **collect connection delay network to-client minimum** **collect connection delay network to-client maximum**
Export Field ID	**IOS and IOS XE:** 40284(sum), 40285(max), 40286(min)
Export Protocol	NetFlow v9, IPFIX

In Figure 2-3, CND is calculated from T5 and T8. Therefore, CND = T8 - T5.

Table 2-7 lists information about the Client Network Time metric with WAAS.

Table 2-7 Client Network Time Metric with WAAS

CU Segment	CND^{CU} is the difference between SYN-ACK from server and ACK of the client.
SO Segment	CND^{SO} is the difference between SYN-ACK from server and ACK of the branch WAAS device observed at the branch router.
CO Segment	CND^{CO} is the difference between SYN-ACK from server and ACK of the branch WAAS device observed at the HQ router.
SU Segment	CND^{SU} is the difference between SYN-ACK from server and ACK of the branch WAAS device observed at the HQ router.

Note In case of WAAS, CND^{CU} can be used to calculate the CND. This will include CND + WAAS delay on both headend and branch. WAAS Delays on branch can be obtained by subtracting CND^{SO} from CND^{CU}. WAAS delay on HQ is CND^{CO} - CND^{SU}

Long Lived Client Network Time [sum/min/max/num-samples]

If you configure mum-sample for network delay, then Long Lived network delays are exported instead of regular Client Network Time.

Table 2-8 lists information about the Long Lived Client Network Time metric.

Table 2-8 Long Lived Client Network Time Metric

Description	Round trip between a Server DATA Packet and ACK packet. If the ACK or DATA packet is dropped, the long-lived delay sample will be ignored.
CLI	**IOS and IOS XE:** **collect connection delay network to-client num-samples** **collect connection delay network to-client sum** **collect connection delay network to-client minimum** **collect connection delay network to-client maximum**
Export Field ID	**IOS and IOS XE:** 42023(sum), 40285(max), 40286(min), 42027(num-samples) **Note** The sum export ID is different from the regular client network delay.
Export Protocol	NetFlow v9, IPFIX

Table 2-9 lists information about the Long Lived Client Network Time metric with WAAS.

Table 2-9 Long Lived Client Network Time Metric with WAAS

CU Segment	LL_CND^{CU} is the difference between a DATA Packet from branch WAAS and ACK of the client
SO Segment	LL_CND^{SO} is the difference between DATA Packet from HQ WAAS and ACK of the branch WAAS device observed at the branch router.
CO Segment	LL_CND^{CO} is the difference between DATA Packet from HQ WAAS and ACK of the branch WAAS device observed at the HQ router.
SU Segment	LL_CND^{SU} is the difference between DATA Packet from server and ACK of the HQ WAAS device observed at the HQ router.

Note In case of WAAS, LL_CND will be the CND of the segment. For example, in Segment CO or SO, the CND is between the two WAAS devices. While on Segment SU, the CND is between the WAAS device and the server. To obtain total LL_CND, sum the LL_CND^{CU} + (LL_CND^{CO} or LL_CND^{SO}) + LL_CND^{SU}.

Server Network Time [sum/min/max]

Table 2-10 lists information about the Server Network Time metric.

Table 2-10 Server Network Time Metric.

Description	Round-trip time between SYN and SYN-ACK. It is also called *Server Network Delay* (SND).
CLI	**IOS and IOS XE:** **collect connection delay network to-server sum** **collect connection delay network to-server minimum** **collect connection delay network to-server maximum**
Export Field ID	**IOS and IOS XE:** 42087(sum), 42088(max), 42089(min)
Export Protocol	NetFlow v9, IPFIX

In Figure 2-3, SND is calculated from T2 to T5. Therefore, SND = T5 - T2.

Table 2-11 lists information about the Server Network Time Metric with WAAS.

Table 2-11 Server Network Time Metric with WAAS

CU Segment	SND^{CU} is the difference between SYN from client and SYN-ACK of the server with WAAS branch and HQ network delay added observed at branch.
SO Segment	SND^{SO} is the difference between SYN from client and SYN-ACK of the server with WAAS HQ network delay added observed at branch.
CO Segment	$SND^{\mathbf{CO}}$ is the difference between SYN from client and SYN-ACK of the server with WAAS HQ network delay added observed at HQ.
SU Segment	SND^{SU} is the difference between SYN from client and SYN-ACK of the server observed at HQ.

Note Same as CND, SND can be used to obtain WAAS delays on both branch and headend. Subtracting SND^{CU} from SND^{SO} gives you the branch WAAS delay. Same applies for HQ WAAS.

Long Lived Server Network Time [sum/min/max/num-samples]

If you configure mum-sample for network delay, then Long Lived network server delays are exported instead of the regular Server Network Time.

Table 2-12 lists information about the Long Lived Server Network Time metric.

Table 2-12 Long Lived Server Network Time Metric.

Description	Round trip between a Client DATA Packet and ACK packet. If the ACK or DATA packet is dropped, the long-lived delay sample will be ignored..
CLI	**IOS and IOS XE:** **collect connection delay network to-server num-samples** **collect connection delay network to- server sum** **collect connection delay network to- server minimum** **collect connection delay network to- server maximum**
Export Field ID	**IOS and IOS XE:** 42022(sum), 40288(max), 40289(min), 42026(num-samples) **Note** The sum export ID is different from the regular client network delay.
Export Protocol	NetFlow v9, IPFIX

Table 2-13 lists information about the Server Network Time Metric with WAAS.

Table 2-13 Long Lived Server Network Time Metric with WAAS

CU Segment	SND^{CU} is the difference between SYN from client and SYN-ACK of the server with WAAS branch and HQ network delay added observed at branch.
SO Segment	SND^{SO} is the difference between SYN from client and SYN-ACK of the server with WAAS HQ network delay added observed at branch.
CO Segment	$SND^{\mathbf{CO}}$ is the difference between SYN from client and SYN-ACK of the server with WAAS HQ network delay added observed at HQ.
SU Segment	SND^{SU} is the difference between SYN from client and SYN-ACK of the server observed at HQ.

Note In case of WAAS, to obtain total LL_SND, sum the LL_SND^{CU} +(LL_SND^{CO} or LL_SND^{SO})+ LL_SND^{SU}.

Network Time [sum/min/max]

Table 2-14 lists the information about the Network Time metric.

Table 2-14 Network Time Metric

Description	Network Time is known as the round-trip time that is the summation of CND and SND. It is also called *Network Delay* (ND).
CLI	**IOS and IOS XE:** **collect connection delay network client-to-server sum** **collect connection delay network client-to-server minimum** **collect connection delay network client-to-server maximum**

Export Field ID	**IOS and IOS XE:** 42081(sum), 42082(max), 42083(min)
Export Protocol	NetFlow v9, IPFIX

In Figure 2-3, Network Delay is calculated from T2 to T8 (RT = T8 - T2). To get the value of ND, ND = SND + CND.

Note In case of WAAS, ND will depend on the value of SND and CND for the segment. ND = SND + CND.

Long Lived Network Time [sum/min/max/num-samples]

Table 2-14 lists the information about the Long Lived Network Time metric.

Table 2-15 Long Lived Network Time Metric

Description	Network Time is known as the round-trip time that is the summation of LL_CND and LL_SND. It is also called *Long Lived Network Delay* (LL_ND).
CLI	**IOS and IOS XE:** **collect connection delay network client-to-server num-samples** **collect connection delay network client-to-server sum** **collect connection delay network client-to-server minimum** **collect connection delay network client-to-server maximum**
Export Field ID	**IOS and IOS XE:** 42024(sum), 42082(max), 42083(min), 42025(num_samples)
Export Protocol	NetFlow v9, IPFIX

Note In case of WAAS, the ND will depend on the value of LL_SND and LL_CND for the segment.

LL_ND = LL_SND + LL_CND

Server Response Time [sum/min/max]

Table 2-16 lists information about the Server Response Time metric.

Table 2-16 Server Response Time Metric

Description	Time taken by an application to respond to a request. It is also called *Application Delay* (AD) or *Application Response Time*.
CLI	**IOS and IOS XE:** **collect connection delay application sum** **collect connection delay application minimum** **collect connection delay application maximum**
Export Field ID	**IOS and IOS XE:** 42074(sum), 42075(max), 42076(min)
Export Protocol	NetFlow v9, IPFIX

AD is calculated using the following formula:

Without WAAS:

AD = RT – SND

If LL_SND is configured, AD = RT – LL_SND

No valid LL_SND sample: IF RT <= LL_SND, AD = 0

With WAAS, see Table 2-17

Table 2-17 Server Response Time Metric with WAAS

CU Segment	If $RT^{CU} > SND^{CU}$, $AD^{CU} = RT^{CU} - SND^{CU}$ If LL_SND is configured: If $RT^{CU} < SND^{CU}$, $AD^{CU} = RT^{CU} - (LL\_SND^{CU} + LL\_SND^{SO})$ WAAS Local response: If $RT^{CU} < (LL\_SND^{CU} + LL\_SND^{SO})$, $AD^{CU} = RT^{CU}$
SO Segment	Invalid
CO Segment	Invalid
SU Segment	If $RT^{SU} > SND^{SU}$, $AD^{SU} = RT^{SU} - SND^{SU}$ If LL_SND is configured: If $RT^{SU} < SND^{SU}$, $AD^{SU} = RT^{SU} - (LL\_SND^{SU} + LL\_SND^{CO})$ WAAS Local response: If $RT^{SU} < (LL\_SND^{SU} + LL\_SND^{CO})$, $AD^{SU} = RT^{SU}$

Response Time [sum/min/max]

Table 2-18 lists information about the Response Time metric.

Table 2-18 Response Time Metric

Description	Amount of time between a client request and the first server response.
CLI	**IOS and IOS XE:** **collect connection delay response to-server sum** **collect connection delay response to-server minimum** **collect connection delay response to-server maximum**
Export Field ID	**IOS and IOS XE:** 40274(sum), 40275(max), 40276(min)
Export Protocol	NetFlow v9, IPFIX

A client request can contain multiple packets. In this case, use the last client packet received.

In case of WAAS, RT will be valid only for segment CU and SU.

Total Response Time [sum/min/max]

Table 2-19 lists information about the Total Response Time metric.

Table 2-19 Total Response Time Metric

Description	Total time taken from the moment a client sends a request until the first response packet from the server is delivered to the client. It is also known as *Total Delay* (TD).
CLI	**IOS and IOS XE:** **collect connection delay response client-to-server sum** **collect connection delay response client-to-server minimum** **collect connection delay response client-to-server maximum**
Export Field ID	**IOS and IOS XE:** 42077(sum), 42078(max), 42079(min)
Export Protocol	NetFlow v9, IPFIX

In Figure 2-3, TD = RT + CND. On XE and IOS, use the following formulae:

- min_totalDelay = min(RT+CND)
- max_totalDelay = max(RT+CND)
- sum_totalDelay = sum(RT+CND)

In case of WAAS, TD will be valid only for segment CU and SU.

Total Transaction Time [sum/min/max]

Table 2-20 lists information about the Total Transaction Time metric.

Table 2-20 Total Transaction Time Metric

Description	Amount of time between the client request and the final response packet from the server. It is measured and exported on receiving either a new request from a client (which indicates the end of the current transaction) or the first FIN packet.
CLI	**IOS and IOS XE:** **collect connection transaction duration sum** **collect connection transaction duration minimum** **collect connection transaction duration maximum**

Export Field ID	**IOS:**
	40277(sum), 40278(max), 40279(min)
	IOS XE:
	42041(sum), 42042(max), 42043(min)

Export Protocol	NetFlow v9, IPFIX

In case of WAAS, TT will be valid only for segment CU and SU.

ART Client Bytes/Packets(Layer 4)

Table 2-21 lists information about the ART Client Bytes/Packets metric.

Table 2-21 ART Client Bytes/Packets Metric

Description	Byte and packet count for all the client packets.
CLI	**IOS and IOS XE:** **collect connection client counter bytes long** **collect connection client counter packets long**
Export Field ID	**IOS and IOS XE:** 231(octet), 298(packets)
Export Protocol	NetFlow v9, IPFIX

L4 bytes and packets from client to server. Alternate commands for the same metric are **collect connection client counter bytes transport long** and **collect connection client counter packets transport long**.

In case of WAAS, each segment will reflect the client bytes/packets on the segment.

ART Server Bytes/Packet(Layer 4)

Table 2-22 lists information about the ART Server Bytes/Packets metrics.

Table 2-22 ART Server Bytes/Packets Metrics

Description	Byte and packet count for all the server packets.
CLI	**IOS and IOS XE:** **collect connection server counter bytes long** **collect connection server counter packets long**
Export Field ID	**IOS and IOS XE:** 232(octets), 299(packets)
Export Protocol	NetFlow v9, IPFIX

L4 bytes and packets from server to client. Alternate commands for the same metrics are **collect connection server counter bytes transport long** and **collect connection server counter packets transport long**.

In case of WAAS, each segment will reflect the client bytes/packets on the segment.

ART Client Bytes(Layer 3)

Table 2-22 lists information about the ART Client Bytes/Packets metric.

Table 2-23 *ART Client Bytes Layer 3 Metric*

Description	Byte and packet count for all the client packets(Layer 3).
CLI	**IOS and IOS XE:** **collect connection client counter bytes network long** **collect connection server counter bytes network long**
Export Field ID	**IOS and IOS XE:** 41106 (octets)
Export Protocol	NetFlow v9, IPFIX

ART Server Bytes(Layer 3)

Table 2-24 lists information about the ART Client Bytes/Packets metric.

Table 2-24 *ART Server Bytes Layer 3 Metric*

Description	Byte and packet count for all the server packets (Layer 3).
CLI	**IOS and IOS XE:** **collect connection client counter bytes network long** **collect connection server counter bytes network long**
Export Field ID	**IOS and IOS XE:** 41105 (octets)
Export Protocol	NetFlow v9, IPFIX

ART Count New Connections

Table 2-25 lists information about the ART Count New Connections metric.

Table 2-25 ART Count New Connections metric

Definition	Number of TCP sessions (3-way handshake) or UDP sessions established. It is also called *number of connections* (sessions).
CLI	**IOS and IOS XE:** **collect connection new-connections**
Export Field ID	**IOS and IOS XE:** 278
Export Protocol	NetFlow v9, IPFIX

ART Concurrent Sessions

Table 2-26 lists information about the ART Concurrent Sessions.

Table 2-26 ART Concurrent Sessions

Description	Number of active concurrent connections at the start of an export interval.
CLI	**IOS:** **collect connection concurrent-connections**
Export Field ID	**IOS:** 42018
Export Protocol	NetFlow v9, IPFIX

Concurrent session metrics is supported only in async/optimized mode. It is not supported in per-packet mode.

ART Count Responses

Table 2-27 lists information about the ART Count Responses metric.

Table 2-27 ART Count Responses Metric

Description	Number of Req-Rsp pair received within the monitoring interval.
CLI	**IOS and IOS XE:** **collect connection server counter responses**
Export Field ID	**IOS and IOS XE:** 42060
Export Protocol	NetFlow v9, IPFIX

In case of WAAS, Count response will be valid only for segment CU and SU and set zero for the CO, SO segments.

Responses Histogram Buckets (7-Bucket Histogram)

Table 2-28 lists information about the Responses Histogram Buckets (7-bucket histogram) metric.

Table 2-28 Responses Histogram Buckets Metric

Description	Number of responses received during the 7-bucket histogram response time.
CLI	**IOS and IOS XE:** **collect connection delay response to-server histogram**
Export Field ID	**IOS and IOS XE:** 42061–42067
Export Protocol	NetFlow v9, IPFIX

The following is the list of threshold values (response time) for the 7-buckets histogram:

- Bucket 1— Less than 2 milliseconds
- Bucket 2— Between 2 to 5 milliseconds
- Bucket 3— Between 5 to 10 milliseconds
- Bucket 4— Between 10 to 50 milliseconds
- Bucket 5— Between 50 to 100 milliseconds
- Bucket 6— Between 100 to 500 milliseconds
- Bucket 7— Between 500 to 1000 milliseconds

ART Count Late Responses

Table 2-29 lists information about the ART Count Late Responses metric.

Table 2-29 ART Count Late Responses Metric

Description	Number of responses received after the maximum response time. It is also called *Number of Late Responses* (timeouts). The current threshold of timeout is 1 second.
CLI	**IOS and IOS XE:** **collect connection delay response to-server histogram late**
Export Field ID	**IOS and IOS XE:** 42068
Export Protocol	NetFlow v9, IPFIX

In case of WAAS, Count response will be valid only for segment CU and SU and set zero for the CO, SO segments. See Figure 2-5 for a definition of the WAAS segments and information on how to incorporate these into AVC flow exports.

ART Count Transactions

Table 2-30 lists information about the ART Count Transactions metric.

Table 2-30 ART Count Transactions Metric

Description	Total number of transactions for all the TCP connections.
CLI	**IOS and IOS XE:** **collect connection transaction counter complete**
Export Field ID	**IOS and IOS XE:** 42040
Export Protocol	NetFlow v9, IPFIX

A new transaction is counted under one of the following conditions:

- Receiving a data packet from a client request while the previous packet state is server response.
- Receiving a client FIN packet while the previous packet state is server response.
- Receiving a server FIN packet while the previous packet state is server response.

In case of WAAS, the Count response will be valid only for segment CU and SU and set to zero for the CO, SO segments.

ART Client Retransmissions Bytes

Table 2-31 lists information about the ART Client Retransmissions Bytes metric.

Table 2-31 ART Client Retransmissions Bytes Metric

Description	ART Count Retransmissions metric is the byte count for all the retransmitted client packets.
CLI	**IOS and IOS XE:** **collect connection client counter bytes retransmitted**
Export Field ID	**IOS and IOS XE:** 42035
Export Protocol	NetFlow v9, IPFIX

ART Client Retransmissions Packets

Table 2-32 lists information about the ART Client Retransmissions Packets metric.

Table 2-32 ART Client Retransmissions Packets Metric

Description	ART Count Retransmissions metric is the packet count for all the retransmitted client packets.
CLI	**IOS and IOS XE:** **collect connection client counter packets retransmitted**
Export Field ID	**IOS and IOS XE:** 42036
Export Protocol	NetFlow v9, IPFIX

If the current packet's sequence number is same as the previous packet's sequence number, then it is a retransmitted packet. In case of WAAS, the retransmissions are counted per segment.

In case of WAAS, the retransmissions are counted per segment.

ART Server Retransmissions Bytes

Table 2-33 lists information about the ART Server Retransmissions Bytes metric.

Table 2-33 ART Server Retransmissions Bytes Metric

Description	ART Count Retransmissions metric is the bytes count for all the retransmitted server packets.
CLI	**IOS and IOS XE:** **collect connection server counter bytes retransmitted**
Export Field ID	**IOS and IOS XE:** 42037
Export Protocol	NetFlow v9, IPFIX

If the current packet's sequence number is same as the previous packet's sequence number, then it is a retransmitted packet. In case of WAAS, the retransmissions are counted per segment.

In case of WAAS, the retransmissions are counted per segment.

ART Server Retransmissions Packets

Table 2-34 lists information about the ART Server Retransmissions Packets metric.

Table 2-34 ART Server Retransmissions Packets Metric

Description	ART Count Retransmissions metric is the packet count for all the retransmitted client packets.
CLI	**IOS and IOS XE:** **collect connection server counter packets retransmitted**

Description	ART Count Retransmissions metric is the packet count for all the retransmitted client packets.
Export Field ID	**IOS and IOS XE:** 42038
Export Protocol	NetFlow v9, IPFIX

If the current packet's sequence number is same as the previous packet's sequence number, then it is a retransmitted packet. In case of WAAS, the retransmissions are counted per segment.

In case of WAAS, the retransmissions are counted per segment.

Client Bytes

Table 2-35 lists information about the Client Bytes metric.

Table 2-35 Client Bytes Metric

Description	Total L3 bytes sent by the initiator of a connection. Counted for TCP and UDP connections.
CLI	**IOS and IOS XE:** **collect connection client counter bytes network long**
Export Field ID	**IOS and IOS XE:** 41106
Export Protocol	NetFlow v9, IPFIX

ART All Metrics

Table 2-36 lists the information about the ART All Metric.

Table 2-36 ART All Metric

Description	Shortcut to enable all ART metrics using a single command.
CLI	**IOS:** **collect connection all**
Export Field ID	N/A
Export Protocol	N/A

Cisco WAAS Interoperation Metrics

Cisco Wide Area Application Services (WAAS) metrics are metrics, such as Data Redundancy Elimination (DRE) input bytes, that are extracted or calculated by the Cisco WAAS engine.

WAAS metrics are not available on the performance monitor record type on IOS.

Table 2-37 lists the WAAS metrics summary.

Table 2-37 ***WAAS Metrics Summary***

Field Name	Field ID
WAAS Segment Number	42020
WAAS Passthrough Reason	42021
WAAS DRE Input	36000
WAAS DRE Output	36001
WAAS Lempel-Ziv Input	36002
WAAS Lempel-Ziv Output	36003
WAAS Input Bytes	36009
WAAS Output Bytes	36010
WAAS Connection Mode	36008
WAAS All Metrics	—

WAAS Segment Number

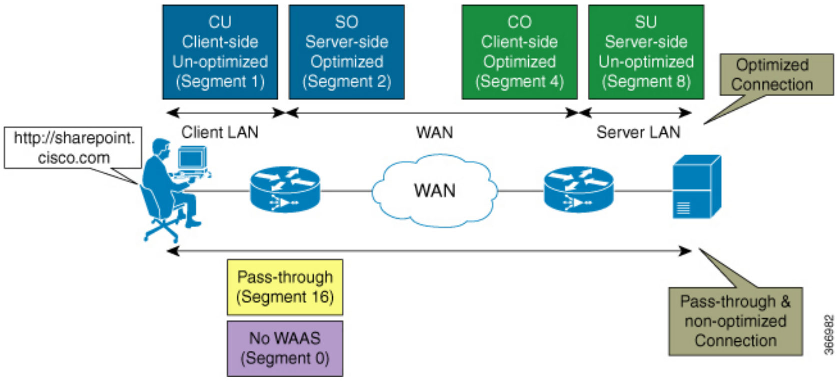
Table 2-38 lists information about the WAAS Segment Number metric.

Table 2-38 WAAS Segment Number Metric

Description	ID number of the WAAS segments.
CLI	**IOS and IOS XE:** **<collect | match> services waas segment**
Export Field ID	**IOS and IOS XE:** 42020
Export Protocol	NetFlow v9, IPFIX

Figure 2-5 shows the WAAS segment ID information.

Figure 2-5 WAAS Segment ID Information



The following are the four segments of WAAS connection in ISR:

- Segment ID 1—WAAS Client Unoptimized (CU)
- Segment ID 2—WAAS Server Optimized (SO)
- Segment ID 4—WAAS Client Optimized (CO)
- Segment ID 8—WAAS Server Unoptimized (SU)

If WAAS decides to pass through the flow, the segment ID is 16. If WAAS does not act on the flow, the segment is 0 (unknown). To receive the WAAS segment ID per flow, ensure that **match services waas segment account-on-resolution** is configured in the AVC flow record.

WAAS Passthrough Reason

Table 2-39 lists information about the Cisco WAAS Passthrough-reason Metrics.

Table 2-39 Cisco WAAS Passthrough-reason Metrics

Definition	Provides the reason if WAAS pass through a packet.
CLI	**IOS and IOS XE:** **collect services waas passthrough-reason**
Export Field ID	**IOS and IOS XE:** 42021
Export Protocol	NetFlow v9, IPFIX

WAAS DRE Input

Table 2-40 lists information about the Cisco WAAS DRE Input metric.

Table 2-40 Cisco WAAS DRE Input Metric

Description	Total input, measured in bytes, to the DRE engine for compression and decompression on a given WAAS segment.
CLI	**IOS and IOS XE:** **collect waas dre input**
Export Field ID	**IOS and IOS XE:** 36000
Export Protocol	NetFlow v9, IPFIX

WAAS DRE Output

Table 2-41 lists information about the Cisco WAAS DRE Output metric.

Table 2-41 Cisco WAAS DRE Output Metric

Description	Total output, measured in bytes, to the DRE engine for compression and decompression on a given WAAS segment.
CLI	**IOS and IOS XE:** **collect waas dre output**
Export Field ID	**IOS and IOS XE:** 36001
Export Protocol	NetFlow v9, IPFIX

WAAS Lempel-Ziv Input

Table 2-42 lists information about the Cisco WAAS Lempel-Ziv (LZ) Input metric.

Table 2-42 Cisco WAAS Lempel-Ziv (LZ) Input Metric

Description	Total input, measured in bytes, to the LZ engine for compression and decompression on a given WAAS segment.
CLI	**IOS and IOS XE:** **collect waas lz input**
Export Field ID	**IOS and IOS XE:** 36002
Export Protocol	NetFlow v9, IPFIX

WAAS Lempel-Ziv Output

Table 2-43 lists information about the Cisco WAAS Lempel-Ziv Output metric.

Table 2-43 Cisco WAAS Lempel-Ziv Output Metric

Description	Total output, measured in bytes, from the Lempel-Ziv engine for compression and decompression on a given WAAS segment.
CLI	**IOS and IOS XE:** **collect waas lz output**
Export Field ID	**IOS and IOS XE:** 36003
Export Protocol	NetFlow v9, IPFIX

WAAS Input Bytes

Table 2-44 lists information about the Cisco WAAS Input Bytes metric.

Table 2-44 Cisco WAAS Input Bytes Metric

Description	Total input, measured in bytes, to the WAAS module on a given WAAS segment.
CLI	**IOS and IOS XE** **collect waas bytes input**
Export Field ID	**IOS and IOS XE:** 36009
Export Protocol	NetFlow v9, IPFIX

WAAS Output Bytes

Table 2-45 lists information about the Cisco WAAS Output Bytes metric.

Table 2-45 Cisco WAAS Output Bytes Metric

Description	Total output, measured in bytes, from the WAAS module on a given WAAS segment.
CLI	**IOS and IOS XE:** **collect waas bytes output**
Export Field ID	**IOS and IOS XE:** 36010
Export Protocol	NetFlow v9, IPFIX

WAAS Connection Mode

Table 2-46 lists the information about the Cisco WAAS Connection Mode metric.

Table 2-46 Cisco WAAS Connection Mode Metric

Definition	Describes the optimization used on the connection.
CLI	**IOS and IOS XE:** **collect waas connection mode**
Export Field ID	**IOS and IOS XE:** 36008
Export Protocol	NetFlow v9, IPFIX

The Cisco WAAS Connection Mode is a bitmask with the following flags:

- Optimize TCP Flow Optimization (TFO)—0x1
- Optimize Data Redundancy Elimination (DRE)—0x2
- Optimize Lempel-Ziv (LZ)—0x4
- Accelerate HTTP—0x08
- Accelerate SSL—0x10

WAAS All Metrics

Table 2-47 lists information about the Cisco WAAS All Metrics.

Table 2-47 Cisco WAAS All Metrics

Definition	Collects all the WAAS-related metrics. This CLI works as a replacement for all the WAAS-related collect statements in a flow record.
CLI	**IOS and IOS XE:** **collect waas all**
Export Field ID	—
Export Protocol	—

QoS Metrics

Quality of Service (QoS) provides prioritization, shaping, and rate-limiting of traffic. High-priority, latency-sensitive traffic can be put into the priority queue. It can also guarantee minimal bandwidth available to an application or group of applications within a QoS traffic class.

For AVC, QoS class map statements allow matching on all the new NBAR2-supported applications and Layer 7 application fields or protocols, as well as on the NBAR2 attributes, which can co-exist with all other traditional QoS match attributes such as IP, subnet, and DSCP.

Table 2-48 lists the QoS metrics summary.

Table 2-48 QoS Metrics Summary

Field Name	**Field ID (IOS XE)**
QoS Policy Classification Hierarchy	41000
QoS Queue Drops	42129
Queue ID	42128

QoS Policy Classification Hierarchy

Table 2-49 lists information about the QoS Policy Classification Hierarchy.

Table 2-49 QoS Policy Classification Hierarchy

Definition	Identifies which hierarchy a QoS queue belongs to.
CLI	**IOS and IOS XE:** **<collect | match> policy qos classification hierarchy** (for QoS class) **<collect | match> policy performance-monitor classification hierarchy** (for perf-mon class)
Export Field ID	**IOS and IOS XE:** 41000
Export Protocol	NetFlow v9, IPFIX

To associate the QoS queue of a particular flow, AVC will export the hierarchy of the class the flow matches with. This hierarchy will be exported in the flow record as a list of IDs. Each ID will be in a separate FNF field. The value of the missing or unnecessary fields defaults to 0. The ID for name mapping will be exported as an option template.

The following example shows the configuration for the basic QoS hierarchy export. The example shows the QoS configuration for parent policy P1 and child policy P11.

```
class-map match-all C1
 match any
class-map match-all C11
 match ip dscp ef
class-map match-all C12
 match ip dscp cs2
!
policy-map P11
 class C11
  bandwidth remaining percent 10
class C12
  bandwidth remaining percent 70
class class-default
  bandwidth remaining percent 20

policy-map P1
 class C1
  shaping average 16000000
  service-policy P11
```

Table 2-50 shows a sample mapping table.

The class hierarchy shows hierarchy information up to 5 class level. Each of these ID is a 4-byte integer representing a C3PL policy-map or class-map. The ID to name mapping will be exported as an option template.

Table 2-50 Sample Mapping Table

Flow ID	Class Hierarchy (41000)	Queue id (42128)
Flow 1	P1, C1, C11, 0, 0, 0	1
Flow 2	P1, C1, C11, 0, 0, 0	1
Flow 3	P1, C1, C12, 0, 0, 0	2

The queue id for a particular class hierarchy will be exported using export field ID 42128.

Two option templates are used to export the class and policy information. The first template is for class ID and class name mapping, and the second template is for policy ID and policy name mapping. The configuration example and the information the option template contains are shown below.

Example:

```
flow exporter my-exporter
    option c3pl-class-table
    option c3pl-policy-table

QoS Class ID Export
  Client: Option classmap option table
  Exporter Format: NetFlow Version 9
  Template ID    : 263
  Source ID      : 0
  Record Size    : 304
  Template layout
  _____________________________________________________________________
  |                 Field                   |  Type | Offset |  Size  |
  ---------------------------------------------------------------------
  | v9-scope system                         |     1 |     0  |     4  |
  | c3pl class cce-id                       | 41001 |     4  |     4  |
  | c3pl class name                         | 41002 |     8  |    40  |
  | c3pl class type                         | 41003 |    48  |   256  |
  ---------------------------------------------------------------------
  Client: Option policymap option table
  Exporter Format: NetFlow Version 9
  Template ID    : 264
  Source ID      : 0
  Record Size    : 304
  Template layout
  _____________________________________________________________________
  |                 Field                   |  Type | Offset |  Size  |
  ---------------------------------------------------------------------
  | v9-scope system                         |     1 |     0  |     4  |
  | c3pl policy cce-id                      | 41004 |     4  |     4  |
  | c3pl policy name                        | 41005 |     8  |    40  |
  | c3pl policy type                        | 41006 |    48  |   256  |
  ---------------------------------------------------------------------
```

QoS Queue Drops

Table 2-51 lists information about the QoS Queue Drops.

Table 2-51 QoS Queue Drops

Definition	Exports two types of tables. The first table contains data pertaining to each flow and the second table captures the data when the TCP Performance timer expires.
CLI	**IOS and IOS XE:** **collect policy qos queue drops**
Export Field ID	**IOS and IOS XE:** 42129
Export Protocol	NetFlow v9, IPFIX

Media Performance Metrics

Table 2-52 lists all the media monitoring-related fields.

Table 2-52 Media Monitoring-Related Fields

Field Name	Description	Field ID (IOS and IOS XE)
[collect | match] transport rtp ssrc	RTP SSRC.	37022
collect transport rtp payload-type	RTP payload type.	37041
collect transport rtp jitter minimum	Minimum jitter for the RTP stream.	37024
collect transport rtp jitter maximum	Maximum jitter for the RTP stream.	37025
collect transport packets lost counter	A count of the number of lost packets from sequencing information.	37019
collect transport packets expected counter	Expected number of packets from sequencing information.	37014
collect transport event packet-loss counter	A count of sets of packets that were lost.	37017
collect counter packets dropped	A count of the packets dropped.	37000
collect application media bytes counter	A count of the number of packets with a media payload.	37004
collect application media bytes rate	Byte rate for the media stream.	37006
collect application media packets counter	A count of the number of packets with a media payload.	37007
collect application media packets rate	Packet rate for the media stream.	37009
collect application media event	Flags indicating media events.	37011
collect monitor event	Flags indicating monitor events.	37012
The following fields require records to be punted to the route processor (RP).		
collect counter flows	Total number of flows.	3
collect transport rtp flow count	Number of RTP flows.	37040
collect application media packets rate variation	Variation in packet rate from configured expected rate.	37010
collect application media packets rate variation minimum	Minimum variation in packet rate from configured expected rate.	37038
collect application media packets rate variation maximum	Maximum variation in packet rate from configured expected rate.	37039
collect application media event	Flags indicating media events.	37011
collect monitor event	Flags indicating monitor events.	37012
collect transport rtp jitter mean	Mean jitter for the RTP stream.	37023
collect transport packets lost rate	Packet loss rate from sequencing information.	37021

Table 2-52 Media Monitoring-Related Fields (continued)

Field Name	Description	Field ID (IOS and IOS XE)
collect transport packets lost rate minimum	Minimum packet loss rate in the aggregated flows.	37047
collect transport packets lost rate maximum	Maximum packet loss rate in the aggregated flows.	37048
collect application media bytes rate	Byte rate for the media stream.	37006
collect application media packets rate	Packet rate for the media stream.	37009
The following fields are metadata-related fields.		
collect application version	Application version id.	105
collect application version name	Application name.	106
collect application vendor	Application vendor-id.	107
collect metadata global-session-id	Metadata global-session-id.	37054
collect metadata multi-party-session-id	Metadata multi-party-session-id.	37055
collect metadata clock-rate	Metadata clock-rate.	37056

General Metrics

Absolute Timestamp

Table 2-53 lists information about the Absolute Timestamp.

Table 2-53 Absolute Timestamp

Definition	Absolute timestamp of the first packet and the last packet of the flow.
CLI	**IOS and IOS XE:** **collect timestamp absolute first** **collect timestamp absolute last**
Export Field ID	**IOS and IOS XE:** 152 (first) 153 (last)
Export Protocol	NetFlow v9, IPFIX

Option Template

A flow record exported to a mapping table is called an *option template*. The following is an example of the CLI:

```
flow exporter my-export
    export-protocol ipfix
    template data timeout <timeout>
    option interface-table timeout <timeout>
    option vrf-table timeout <timeout>
    option sampler-table timeout <timeout>
    option application-table timeout <timeout>
    option application-attributes timeout <timeout>
    option sub-application-table timeout <timeout>
```

Traffic Volume

Traffic volume fields are similar to the FNF fields. For more information, see: http://www.cisco.com/en/US/technologies/tk648/tk362/technologies_white_paper09186a00800a3db9.html.

Field ID Comparison

Cisco ISR G2 and Cisco ASR 1000 should export compatible data. The following are the differences in the solution due to the architectural dissimilarities:

- URL export—In IOS XE platforms, URLs are exported per transaction, while in IOS the URLs are exported as a concatenated field over 4-tuple.