Abstract

This document describes some additional Information Elements of Cisco Systems, Inc. that are not listed in RFC3954.

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1. Introduction

The section 4 of [RFC5102] defines the IPFIX Information Elements in the range of 1-127 to be compatible with the NetFlow version 9 fields, as specified in the "Cisco Systems NetFlow Services Export Version 9" [RFC3954]. As [RFC3954] was specified in 2004, it does not contain all NetFlow version 9 specific fields in the range 1-127. The question was asked whether IPFIX Devices should exclusively report the IPFIX IANA IEs [IPFIX-IANA] ? In other words, when upgrading from a NetFlow metering process to an IPFIX Metering Process, should the IPFIX Devices stop reporting NetFlow version 9 specific IEs that were not registered in IANA [IPFIX-IANA] ?

This document is intended to fill the gap in this IE range. That way, IPFIX implementations could export all the IEs specified in IANA, regardless of the range.

2. Terminology

IPFIX-specific terminology used in this document is defined in Section 2 of [RFC5101]. As in [RFC5101], these IPFIX-specific terms have the first letter of a word capitalized when used in this document.

3. Information Elements

3.1. fsFlowEntryTotalCount

Description:
This Information Element specifies the current number of all Flow Records that form the parent population as input to the Flow Selection Process.
Abstract Data Type:  unsigned64
ElementId:  3
Semantics:  quantity
Status:  current
Units:  flows
RFC EDITOR NOTE:  if the Flow Selection Techniques document [I-D.ietf-ipfix-flow-selection-tech] is published before this, then remove this entry. This Information Element is similar to ’fsFlowEntryTotalCount’ there.

3.2. samplingInterval
Description:
When using sampled NetFlow, the rate at which packets are sampled — e.g. a value of 100 indicates that one of every 100 packets is sampled. Deprecated in favor of 305 samplingPacketInterval.
Abstract Data Type: unsigned32
ElementId: 34
Semantics: quantity
Status: deprecated
Units: packets

3.3. samplingAlgorithm

Description:
The type of algorithm used for sampled NetFlow: 0x01 Deterministic Sampling, 0x02 Random Sampling. The values are not compatible with the selectorAlgorithm field, where "Deterministic" has been replaced by "Systematic count-based" (1) or "Systematic time-based" (2), and "Random" is (3). Conversion is required, see PSAMP parameters [PSAMP-IANA]. Deprecated in favor of 304 selectorAlgorithm.
Abstract Data Type: unsigned8
ElementId: 35
Semantics: identifier
Status: deprecated

3.4. engineType

Description:
Type of flow switching engine in a router/switch: RP = 0, VIP/Line card = 1, PFC/DFC = 2. Reserved for internal use on the collector.
Abstract Data Type: unsigned8
ElementId: 38
Semantics: identifier
Status: deprecated

3.5. engineId

Description:
VIP or line card slot number of the flow switching engine in a router/switch. Reserved for internal use on the collector.
Abstract Data Type: unsigned8
ElementId: 39
Semantics: identifier
Status: deprecated

3.6. ipv4RouterSc

Description:
This is a platform-specific field. It is used to store the address of a router that is being shortcut when performing the MultiLayer Switching.
Abstract Data Type: ipv4Address
ElementId: 43
Semantics: ipv4Address
Status: deprecated

3.7. flowSamplerId

Description:
The unique identifier associated with samplerName. Deprecated in favor of 302 selectorId.
Abstract Data Type: unsigned8
ElementId: 48
Semantics: identifier
Status: deprecated

3.8. flowSamplerMode

Description:
The type of algorithm used for sampling data: 0x01 - deterministic, 0x02 - random sampling. Use with flowSamplerRandomInterval. Deprecated in favor of 304 selectorAlgorithm. The values are not compatible: selectorAlgorithm=3 is random sampling.
Abstract Data Type: unsigned8
ElementId: 49
Semantics: identifier
Status: deprecated

3.9. flowSamplerRandomInterval

Description:
Packet interval at which to sample - in case of random sampling. Used in connection with flowSamplerMode 0x02 (random sampling) value. Deprecated in favour of 305 samplingPacketInterval.
Abstract Data Type: unsigned32
ElementId:  50  
Semantics:  quantity  
Status:  deprecated  

3.10.  classId  

description:
   characterizes the traffic class, i.e. QoS treatment. Deprecated in favour of 302 selectorId.
Abstract Data Type:  unsigned8  

ElementId:  51  
Semantics:  identifier  
Status:  deprecated  

3.11.  samplerName  

description:
   name of the flow sampler. Deprecated in favor of 335 selectorName.
Abstract Data Type:  string  

ElementId:  84  
Status:  deprecated  

3.12.  flagsAndSamplerId  

description:
   Flow flags and the value of the sampler ID (flowSamplerId) combined in one bitmapped field. Reserved for internal use on the collector.
Abstract Data Type:  unsigned32  

ElementId:  87  
Semantics:  identifier  
Status:  deprecated  

3.13.  forwardingStatus  

description:
   The field describes the forwarding status of the flow and any attached reasons. The Reduced Size Encoding rules as per [RFC5101] apply.

The basic encoding is 8 bits. The future extensions could add one or three bytes. The layout of the basic encoding is as follows:

```
+---+---+---+---+---+---+---+---+
| Status| Reason code or flags |
```

Status:

00b = Unknown
01b = Forwarded
10b = Dropped
11b = Consumed

Reason Code (status = 01b, Forwarded)

01 000000b = 64 = Unknown
01 000001b = 65 = Fragmented
01 000010b = 66 = Not Fragmented

Reason Code (status = 10b, Dropped)

10 000000b = 128 = Unknown
10 000001b = 129 = ACL deny
10 000010b = 130 = ACL drop
10 000011b = 131 = Unroutable
10 000100b = 132 = Adjacency
10 000101b = 133 = Fragmentation and DF set
10 000110b = 134 = Bad header checksum
10 000111b = 135 = Bad total Length
10 001000b = 136 = Bad header length
10 001001b = 137 = bad TTL
10 001010b = 138 = Policer
10 001011b = 139 = WRED
10 001100b = 140 = RPF
10 001101b = 141 = For us
10 001110b = 142 = Bad output interface
10 001111b = 143 = Hardware

Reason Code (status = 11b, Consumed)

11 000000b = 192 = Unknown
11 000001b = 193 = Punt Adjacency
11 000010b = 194 = Incomplete Adjacency
11 000011b = 195 = For us

Examples:

value : 0x40 = 64
binary: 01000000
decode: 01 -> Forward
         000000 -> No further information
value : 0x89 = 137
binary: 10001001
decode: 10        -> Drop
              001001 -> Fragmentation and DF set

Abstract Data Type:  unsigned32
ElementId:  89
Semantics:  identifier
Status:  current
Reference:
    See NetFlow Version 9 Record Format [CCO-NF9FMT].

3.14.  srcTrafficIndex

Description:
    BGP Policy Accounting Source Traffic Index
Abstract Data Type:  unsigned32
ElementId:  92
Semantics:  identifier
Status:  current
Reference:
    BGP policy accounting as described in [CCO-BGPPOL]

3.15.  dstTrafficIndex

Description:
    BGP Policy Accounting Destination Traffic Index
Abstract Data Type:  unsigned32
ElementId:  93
Semantics:  identifier
Status:  current
Reference:
    BGP policy accounting as described in [CCO-BGPPOL]

3.16.  className

Description:
    Traffic Class Name, associated with the classId Information Element.  Deprecated in favor of 335 selectorName.
Abstract Data Type:  string
ElementId:  100
Status:  deprecated
3.17. layer2packetSectionOffset

Description:
Layer 2 packet section offset. Potentially a generic packet section offset.
Abstract Data Type: unsigned16
ElementId: 102
Semantics: quantity
Status: current
EDITOR’S NOTE: [I-D.kashima-ipfix-data-link-layer-monitoring] contains a corresponding field ‘sectionOffset’ with a better description. One solution is to assign the value 102 for the ‘sectionOffset’ in [I-D.kashima-ipfix-data-link-layer-monitoring].

3.18. layer2packetSectionSize

Description:
Layer 2 packet section size. Potentially a generic packet section size.
Abstract Data Type: unsigned16
ElementId: 103
Semantics: quantity
Status: current
EDITOR’S NOTE: [I-D.kashima-ipfix-data-link-layer-monitoring] contains a corresponding field ‘sectionObservedOctets’ with a better description. One solution is to assign the value 103 to ‘sectionObservedOctets’ in [I-D.kashima-ipfix-data-link-layer-monitoring].

3.19. layer2packetSectionData

Description:
Layer 2 packet section data.
Abstract Data Type: octetArray
ElementId: 104
Status: current
EDITOR’S NOTE: [I-D.kashima-ipfix-data-link-layer-monitoring] contains a corresponding field ‘dataLinkFrameSection’ with a better description. One solution is to assign the value 104 to ‘dataLinkFrameSection’ in [I-D.kashima-ipfix-data-link-layer-monitoring].

4. Other Information Elements
4.1. Application Information IEs

ElementId: 101

ElementId: 94 .. 97

Please refer to the Export of Application Information in IPFIX
[I-D.claise-export-application-info-in-ipfix]

5. IANA Considerations

This document specifies several new IPFIX Information Elements in the
IPFIX Information Element registry as defined in Section 3 above.
The following Information Elements must be assigned:

- Information Element Number 3 for the fsFlowEntryTotalCount
  Information Element
- Information Element Number 34 for the samplingInterval Information
  Element
- Information Element Number 35 for the samplingAlgorithm
  Information Element
- Information Element Number 38 for the engineType Information
  Element
- Information Element Number 39 for the engineId Information Element
- Information Element Number 43 for the ipv4RouterSc Information
  Element
- Information Element Number 48 for the flowSamplerId Information
  Element
- Information Element Number 49 for the flowSamplerMode Information
  Element
- Information Element Number 50 for the flowSamplerRandomInterval
  Information Element
- Information Element Number 51 for the classId Information Element
- Information Element Number 84 for the samplerName Information
  Element
- Information Element Number 87 for the flagsAndSamplerId
  Information Element
- Information Element Number 89 for the forwardingStatus Information
  Element
- Information Element Number 92 for the srcTrafficIndex Information
  Element
- Information Element Number 93 for the dstTrafficIndex Information
  Element
- Information Element Number 100 for the className Information
  Element
6. Security Considerations

This document specifies the definitions and does not alter the security considerations of the base protocol. Please refer to the security considerations sections of RFC 3954 [RFC3954] and RFC 5102 [RFC5102].

7. References

7.1. Normative References


7.2. Informative References


[ I-D.ietf-ipfix-flow-selection-tech ]
Appendix A. XML Specification of IPFIX Information Elements

<?xml version="1.0" encoding="UTF-8"?>

<fieldDefinitions xmlns="urn:ietf:params:xml:ns:ipfix-info"
 xmlns:xsi="http://www.w3.org/2001/XMLSchema-instance"
 xsi:schemaLocation="urn:ietf:params:xml:ns:ipfix-info ipfix-info.xsd">

<field name="fsFlowEntryTotalCount" dataType="unsigned64"
 group=""
dataTypeSemantics="quantity"
 elementId="3" applicability="flow" status="current">
 <description>
  <paragraph>
   This Information Element specifies the current number of all
   Flow Records that form the parent population as input to the
   Flow Selection Process.
  </paragraph>
 </description>

</fieldDefinitions>
<field name="samplingInterval" dataType="unsigned32"
    group=""
dataTypeSemantics="quantity"
elementId="34" applicability="flow" status="deprecated">
<description>
    <paragraph>
    When using sampled NetFlow, the rate at which packets are
    sampled - e.g. a value of 100 indicates that one of every 100
    packets is sampled. Deprecated in favor of 305
    samplingPacketInterval.
    </paragraph>
</description>
</field>

<field name="samplingAlgorithm" dataType="unsigned8"
    group=""
dataTypeSemantics="identifier"
elementId="35" applicability="flow" status="deprecated">
<description>
    <paragraph>
    The type of algorithm used for sampled NetFlow: 0x01
    Deterministic Sampling, 0x02 Random Sampling. The values are not
    compatible with the selectorAlgorithm field, where
    "Deterministic" has been replaced by "Systematic count-based"
    (1) or "Systematic time-based" (2), and "Random" is (3).
    Conversion is required, see PSAMP parameters. Deprecated in
    favor of 304 selectorAlgorithm.
    </paragraph>
</description>
</field>

<field name="engineType" dataType="unsigned8"
    group=""
dataTypeSemantics="identifier"
elementId="38" applicability="flow" status="deprecated">
<description>
    <paragraph>
    Type of flow switching engine in a router/switch: RP = 0,
    VIP/Line card = 1, PFC/DFC = 2. Reserved for internal use on the
    collector.
    </paragraph>
</description>
</field>

<field name="engineId" dataType="unsigned8"
    group=""
dataTypeSemantics="identifier"
elementId="39" applicability="flow" status="deprecated">
<description>
    <paragraph>
VIP or line card slot number of the flow switching engine in a router/switch. Reserved for internal use on the collector.

>This is a platform-specific field. It is used to store the address of a router that is being shortcut when performing the MultiLayer Switching.

>The unique identifier associated with samplerName. Deprecated in favor of 302 selectorId.

>The type of algorithm used for sampling data: 0x01 - deterministic, 0x02 - random sampling. Use with flowSamplerRandomInterval. Deprecated in favor of 304 selectorAlgorithm. The values are not compatible: selectorAlgorithm=3 is random sampling.
Packet interval at which to sample - in case of random sampling. Used in connection with flowSamplerMode 0x02 (random sampling) value. Deprecated in favour of 305 samplingPacketInterval.
</description>
</field>

<field name="classId" dataType="unsigned8"
    group=""
    dataTypeSemantics="identifier"
    elementId="51" applicability="flow" status="deprecated">

<description>
    <paragraph>
    Characterizes the traffic class, i.e. QoS treatment. Deprecated in favour of 302 selectorId.
    </paragraph>
</description>
</field>

<field name="samplerName" dataType="string"
    group=""
    dataTypeSemantics=""
    elementId="84" applicability="flow" status="deprecated">

<description>
    <paragraph>
    Name of the flow sampler. Deprecated in favor of 335 selectorName.
    </paragraph>
</description>
</field>

<field name="flagsAndSamplerId" dataType="unsigned32"
    group=""
    dataTypeSemantics="identifier"
    elementId="87" applicability="flow" status="deprecated">

<description>
    <paragraph>
    Flow flags and the value of the sampler ID (flowSamplerId) combined in one bitmapped field. Reserved for internal use on the collector.
    </paragraph>
</description>
</field>

<field name="forwardingStatus" dataType="unsigned32"
    group=""
    dataTypeSemantics="identifier"
    elementId="89" applicability="flow" status="current">

<description>
    <paragraph>
    The field describes the forwarding status of the flow and any attached reasons. The Reduced Size Encoding rules as per apply.
    </paragraph>
</description>

    

The basic encoding is 8 bits. The future extensions could add one or three bytes. The layout of the basic encoding is as follows:

```
MSB -   0   1   2   3   4   5   6   7 - LSB
       +---+---+---+---+---+---+---+---+
       | Status| Reason code or flags |
       +---+---+---+---+---+---+---+---+
```

Status:

- 00b = Unknown
- 01b = Forwarded
- 10b = Dropped
- 11b = Consumed

Reason Code (status = 01b, Forwarded)

- 01 000000b = 64 = Unknown
- 01 000001b = 65 = Fragmented
- 01 000010b = 66 = Not Fragmented

Reason Code (status = 10b, Dropped)

- 10 000000b = 128 = Unknown
- 10 000001b = 129 = ACL deny
- 10 000010b = 130 = ACL drop
- 10 000011b = 131 = Unroutable
- 10 000100b = 132 = Adjacency
- 10 000101b = 133 = Fragmentation and DF set
- 10 000110b = 134 = Bad header checksum
- 10 000111b = 135 = Bad total Length
- 10 001000b = 136 = Bad header length
- 10 001001b = 137 = bad TTL
- 10 001010b = 138 = Policer
- 10 001011b = 139 = WRED
- 10 001100b = 140 = RPF
- 10 001101b = 141 = For us
- 10 001110b = 142 = Bad output interface
- 10 001111b = 143 = Hardware

Reason Code (status = 11b, Consumed)

- 11 000000b = 192 = Unknown
- 11 000001b = 193 = Punt Adjacency
- 11 000010b = 194 = Incomplete Adjacency
Examples:

value : 0x40 = 64
binary: 01000000
decode: 01 -> Forward
000000 -> No further information

value : 0x89 = 137
binary: 10001001
decode: 10 -> Drop
001001 -> Fragmentation and DF set

</description>
</field>

<field name="srcTrafficIndex" dataType="unsigned32"
group=""
datatypeSemantics="identifier"
elementId="92" applicability="flow" status="current">
<description>
<paragraph>
BGP Policy Accounting Source Traffic Index
</paragraph>
</description>
</field>

<field name="dstTrafficIndex" dataType="unsigned32"
group=""
datatypeSemantics="identifier"
elementId="93" applicability="flow" status="current">
<description>
<paragraph>
BGP Policy Accounting Destination Traffic Index
</paragraph>
</description>
</field>

<field name="className" dataType="string"
group=""
datatypeSemantics=""
elementId="100" applicability="flow" status="deprecated">
<description>
<paragraph>
Traffic Class Name, associated with the classId Information Element. Deprecated in favor of 335 selectorName.
</paragraph>
</description>
</field>

<field name="layer2packetSectionOffset" dataType="unsigned16"
Layer 2 packet section offset. Potentially a generic packet section offset.

Layer 2 packet section size. Potentially a generic packet section size.

Layer 2 packet section data.

Authors’ Addresses

Andrew Yourtchenko
Cisco Systems, Inc.
De Kleetlaan, 7
Brussels, Diegem B-1831
Belgium

Phone: +32 2 704 5494
Email: ayourtch@cisco.com