Export of Structured Data in IPFIX

IPFIX IETF-76 Nov 11th, 2009

<draft-ietf-ipfix-structured-data-00.txt>

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Introduction

• This draft is an extension to [RFC5101] and [RFC5102]
  Support hierarchical structured data and lists (sequences) of Information Elements in data records
• Based on draft-claise-structured-data-in-ipfix-02
New Abstract Data Type and Information Element: basicList

basicList represents a list of zero or more instances of any single Information Element. Primarily used for single-valued data types.

Can also contain 0xFFFF for variable length

Example: list of output interfaces, list of BGP AS Path, list of port numbers
New Abstract Data Type and Information Element: subTemplateList

subTemplateList represents a list of zero or more instances of structured data, where the data type of each list element is the same and corresponds with a single Template Record.

```
+-----------------+------------------+
| Template ID     | SubTemplateList Content |
| +-----------------+------------------+
|                 | ...               |
+-----------------+------------------+
```

Figure E: subTemplateList Encoding

Example: MPLS label stack, src/dst IP addresses pairs, performance metric for a fixed tuple
New Abstract Data Type and Information Element: subTemplateMultiList

SubTemplateMultiList

represents a list of zero or more instances of structured data, where the data type of each list element can be different and correspond with different template definitions.

<table>
<thead>
<tr>
<th>Element 1 Template Id</th>
<th>Element 1 Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element 2 Template Id</th>
<th>Element 2 Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Element N Template Id</th>
<th>Element N Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>...</td>
<td></td>
</tr>
</tbody>
</table>

Example:

aggregated observation point in a mediation function
New in This Version
Improved subTemplateMultiList Example

• Flow record (263)
  | (sourceIPv4Address)
  | (destinationIPv4Address)
  | (sourceTransportPort)
  | (destinationTransportPort)
  | (protocolIdentifier)
  | (octetTotalCount)
  | (packetTotalCount)

+------ classification attributes (261)
  | (selectorId)
  | (selectorAlgorithm)

+------ sampling attributes (262)
  | (selectorId)
  | (selectorAlgorithm)
  | (samplingPacketInterval)
  | (samplingPacketSpace)

• Some traffic will be filtered according to match properties configured, some will be sampled, some will be filtered and sampled, and some will not be filtered nor be sampled.

• Selector Report Interpretation [PSAMP RFC 5476]
New in This Version
Relationship with Other RFCs

• Changed the `subTemplateMultiList` encoding to be consistent with set headers

• Relationship with Reducing Redundancy [RFC5473]
  “When Structured Data Information Elements contain repeated elements, these elements may be replaced with a `commonPropertiesID` Information Element”
  However, a detailed analysis of the gain has not been done

• Relationship with Bidirectional Flow Export [RFC5103]
  “Encoding Biflows with `subTemplateList` or `subTemplateMultiList` provides a more logical division of the information in both directions, although this encoding incurs a small additional bandwidth penalty.”
  New example in Appendix B
New in This Version

- Improve BasicList example: a list of outgoing interfaces
  Requested in the past in draft-kobayashi-ipfix-multicast-measure-00
- Options Template Set
  “Structured Data Information Elements MAY be used in Options Template Sets.” is now clearly specified
  Complex aggregated observation point: example and encoding
  Might be useful in an IPFIX Mediator
- Move the IPS alert example to Appendix C,
  This demonstrates usage of all structured data Information Elements in a single example
Only One Open Issue: Logical OR? More Semantic

- **Example: basicList of egress interfaces in a Flow Record**
  - Has every counted packet been sent on every egress interface?
    - multicast case = AND semantic
  - Has every counted packet been sent on any one of the egress interfaces?
    - load balancing case = OR semantic

- **Solution 1:** the semantic of list content is out of scope, the semantic must be clear from the context or the definition of the Information Elements used within the lists.

- **Solution 2:** We define semantic lists, such as andBasicList, andSubTemplateList, andSubTemplateMultiList, orBasicList, orSubTemplateList, and orSubTemplateMultiList describing AND and OR semantic
  - Logical OR useful in some IPFIX Mediator cases

- **Solution 3:** provide the ability to specify AND, OR, NOT and parenthesis(!!) per field
  - eg, "(eth1 OR eth2) AND (NOT (eth3 OR eth4)) OR linecard2"

- Proposal: don’t go for solution 3
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