Export of Structured Data in IPFIX

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<draft-claise-structured-data-in-ipfix-01>

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Introduction

- **IPFIX has always been about flat records**

  Even if the Options Template could help

- **This draft is a extension to [RFC5101] and [RFC5102]**

  Support hierarchical structured data and lists (sequences) of Information Elements in data records

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.
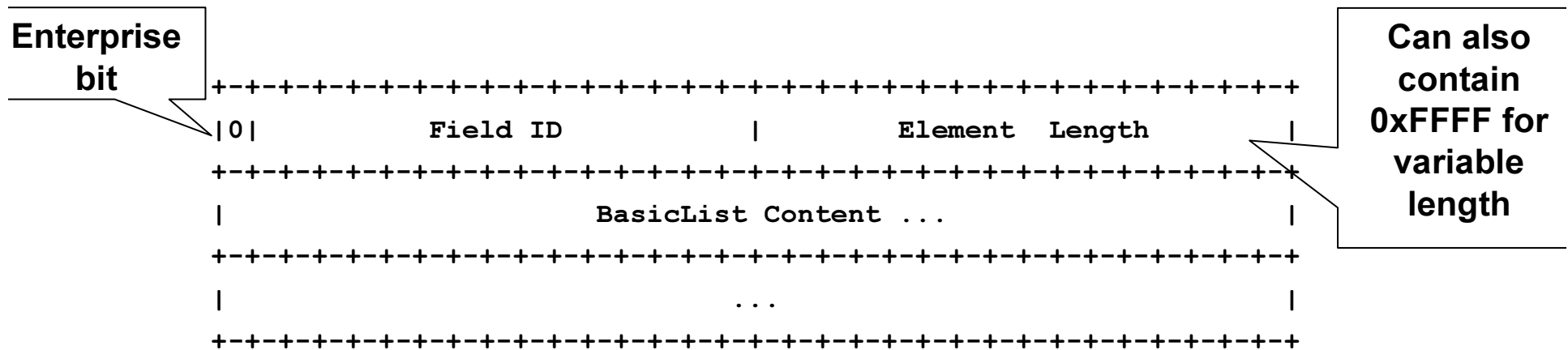
Enterprise bit

Can also contain 0xFFFF for variable length

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|0|           Field ID          |        Element  Length        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                    BasicList Content ...                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                            ...                                |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

Figure A: basicList Information Element Encoding

Example: multicast output interfaces, 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.
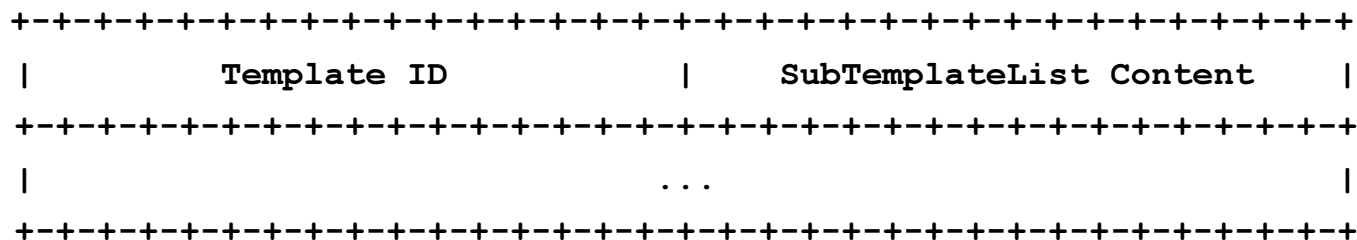
```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|          Template ID         |     SubTemplateList Content    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                             ...                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
              Figure E: subTemplateList Encoding
```

Example: MPLS label stack, pairs of IP addresses, 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.

Example: Aggregated Observation point in a mediation function, IPS alert

```
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Element 1 Length       |      Element 1 Template ID    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Element 1 Content ...                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ...                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Element 2 Length       |      Element 2 Template ID    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Element 2 content ...                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                              ...                              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Element N Length       |      Element N Template ID    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                       Element N content ...                   |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

New in Version 01

- **Justifications why we need this structured data type and why appropriate protocols are not suitable**

    IPFIX Limitations

- **Less focus on security**

- **Discussion about the recursive structured data**

- **Connection with the current IPFIX mediation function work**

- **Connection with the one-way delay export, specified in PSAMP**

    Example: list of (observationTimeMicroseconds, digestHashValue)

New in Version 01

- **Length Encoding Considerations**

  Three-byte length is RECOMMENDED

- **Usage Guidelines for Equivalent Data Representations**

- **Example of an aggregated observation point in a mediation function, which might be needed as a scope in an options template record**

- **XML specifications of IPFIX Information Elements**

What's the Next Step?

- **Correct one small mistake in the example (posted on the mailing list)**

- **Brian proposed to change the subTemplateMultiList encoding to be consistent with Set Header**