

Export of Segment Routing IPv6 Information in IPFIX

draft-ietf-opsawg-ipfix-srv6-srh-02

Enabling insights in SRv6 forwarding plane
by adding Segment Routing dimensions

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SRv6 @ IPFIX

Draft Status

- Received comments from SPRING, OPSAWG and network vendors working on implementations and
- **Addressed all open issues.** Verified with IANA how to manage the `srhFlagsIPv6` and `srhSegmentEndpointBehavior` registries. Outcome is to have a reference to the "Segment Routing Header" registry instead of listing the entries in the IPFIX registry.
- Expanded the terminology section to have a consolidated view on which terms are inherited from which RFC.
- Added "Segment Routing Policy" in the `srhActiveSegmentIPv6Type` registry.
- Added "Multiple Segment Routing Headers" in the "Operational Considerations" section.
- Corrected "Template Record and Data Set with SRH Section" example.

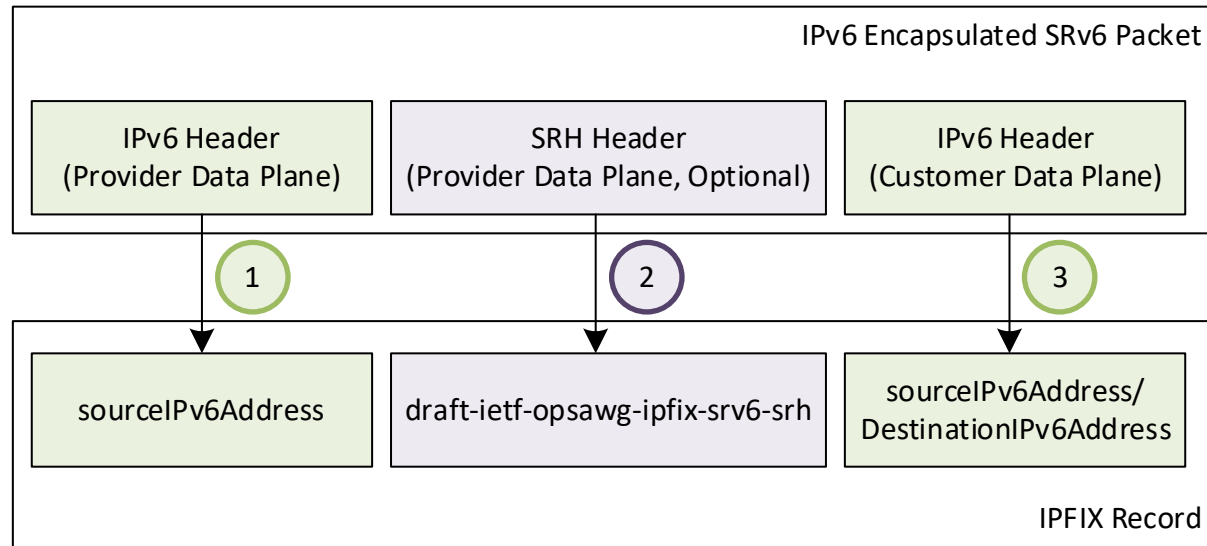
SRv6 @ IPFIX

VPP implementation status – lab topology

- Describe lab topology.
- Describe where source code is available. Current limitations and next steps.

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VPP implementation status – record order matters



- Shows an IPFIX data-template example for a IPv6 encapsulated SRv6 Packet. **IPFIX entity sourceIPv6Address appears twice.**
- Order of the data records matter as described in Section 8 of [RFC7011].** Distinguishes between the tunneled Customer Data Plane and the Provider Data Plane.

```
> Ethernet II, Src: 02:fe:8e:15:ec:19 (02:fe:8e:15:ec:19), Dst: 76:d6:24:24:bf:67 (76:d6:24:24:bf:67)
> Internet Protocol Version 4, Src: 22.22.22.22, Dst: 10.11.4.1
> User Datagram Protocol, Src Port: 4739, Dst Port: 4739
✓ Cisco NetFlow/IPFIX
  Version: 10
  Length: 72
  Timestamp: Oct 12, 2022 12:17:43.000000000 W. Europe Daylight Time
  FlowSequence: 2
  Observation Domain Id: 1
  ✓ Set 1 [id=2] (Data Template): 256
    FlowSet Id: Data Template (V10 [IPFIX]) (2)
    FlowSet Length: 56
    ✓ Template (Id = 256, Count = 12)
      Template Id: 256
      Field Count: 12
      > Field (1/12): IPV6_SRC_ADDR
      ✓ Field (2/12): Unknown(503)
        0... .. = Pen provided: No
        .000 0001 1111 0111 = Type: Unknown (503)
        Length: 16
      ✓ Field (3/12): Unknown(510)
        0... .. = Pen provided: No
        .000 0001 1111 1110 = Type: Unknown (510)
        Length: 2
      ✓ Field (4/12): Unknown(506)
        0... .. = Pen provided: No
        .000 0001 1111 1010 = Type: Unknown (506)
        Length: 1
      ✓ Field (5/12): Unknown(500)
        0... .. = Pen provided: No
        .000 0001 1111 0100 = Type: Unknown (500)
        Length: 1
      ✓ Field (6/12): Unknown(501)
        0... .. = Pen provided: No
        .000 0001 1111 0101 = Type: Unknown (501)
        Length: 2
      ✓ Field (7/12): Unknown(505)
        0... .. = Pen provided: No
        .000 0001 1111 1001 = Type: Unknown (505)
        Length: 128
      ✓ Field (8/12): Unknown(504)
        0... .. = Pen provided: No
        .000 0001 1111 1000 = Type: Unknown (504)
        Length: 65535 [i.e.: "Variable Length"]
      > Field (9/12): IPV6_SRC_ADDR
      > Field (10/12): IPV6_DST_ADDR
      > Field (11/12): PKTS
      > Field (12/12): BYTES
```

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VPP implementation status – records exposed

(1) **srhActiveSegmentIPv6**

128-bit IPv6 address that represents the active SRv6 segment.

(2) **srhSegmentEndpointBehavior**

16-bit unsigned integer that represents a SRv6 Endpoint behavior as per Section 4 of [RFC8986].

(3) **srhSegmentIPv6sLeft**

8-bit unsigned integer defining the number of route segments remaining to reach the end of the segment list.

(4) **srhFlagsIPv6**

8-bit flags defined in the SRH.

(5) **srhTagIPv6**

16-bit tag field defined in the SRH that marks a packet as part of a class or group of packets sharing the same set of properties.

(6) **srhSegmentIPv6ListSection**

Exposes the SRH Segment List as defined in section 2 of [RFC8754] as series of n octets.

(7) **srhSegmentIPv6BasicList**

Ordered basicList [RFC6313] of zero or more 128-bit IPv6 addresses in the SRH that represents the SRv6 segment list. The Segment List is encoded starting from the active segment of the SR Policy.

```
> Ethernet II, Src: 02:fe:8e:15:ec:19 (02:fe:8e:15:ec:19), Dst: 76:d6:24:24:bf:67 (76:d6:24:24:bf:67)
> Internet Protocol Version 4, Src: 22.22.22.22, Dst: 10.11.4.1
> User Datagram Protocol, Src Port: 4739, Dst Port: 4739
v Cisco NetFlow/IPFIX
  Version: 10
  Length: 72
  Timestamp: Oct 12, 2022 12:17:43.000000000 W. Europe Daylight Time
  FlowSequence: 2
  Observation Domain Id: 1
  v Set 1 [id=2] (Data Template): 256
    FlowSet Id: Data Template (V10 [IPFIX]) (2)
    FlowSet Length: 56
    v Template (Id = 256, Count = 12)
      Template Id: 256
      Field Count: 12
      > Field (1/12): IPV6_SRC_ADDR
      v Field (2/12): Unknown(503)
        0... .. = Pen provided: No
        .000 0001 1111 0111 = Type: Unknown (503)
        Length: 16
      v Field (3/12): Unknown(510)
        0... .. = Pen provided: No
        .000 0001 1111 1110 = Type: Unknown (510)
        Length: 2
      v Field (4/12): Unknown(506)
        0... .. = Pen provided: No
        .000 0001 1111 1010 = Type: Unknown (506)
        Length: 1
      v Field (5/12): Unknown(500)
        0... .. = Pen provided: No
        .000 0001 1111 0100 = Type: Unknown (500)
        Length: 1
      v Field (6/12): Unknown(501)
        0... .. = Pen provided: No
        .000 0001 1111 0101 = Type: Unknown (501)
        Length: 2
      v Field (7/12): Unknown(505)
        0... .. = Pen provided: No
        .000 0001 1111 1001 = Type: Unknown (505)
        Length: 128
      v Field (8/12): Unknown(504)
        0... .. = Pen provided: No
        .000 0001 1111 1000 = Type: Unknown (504)
        Length: 65535 [i.e.: "Variable Length"]
      > Field (9/12): IPV6_SRC_ADDR
      > Field (10/12): IPV6_DST_ADDR
      > Field (11/12): PKTS
      > Field (12/12): BYTES
```

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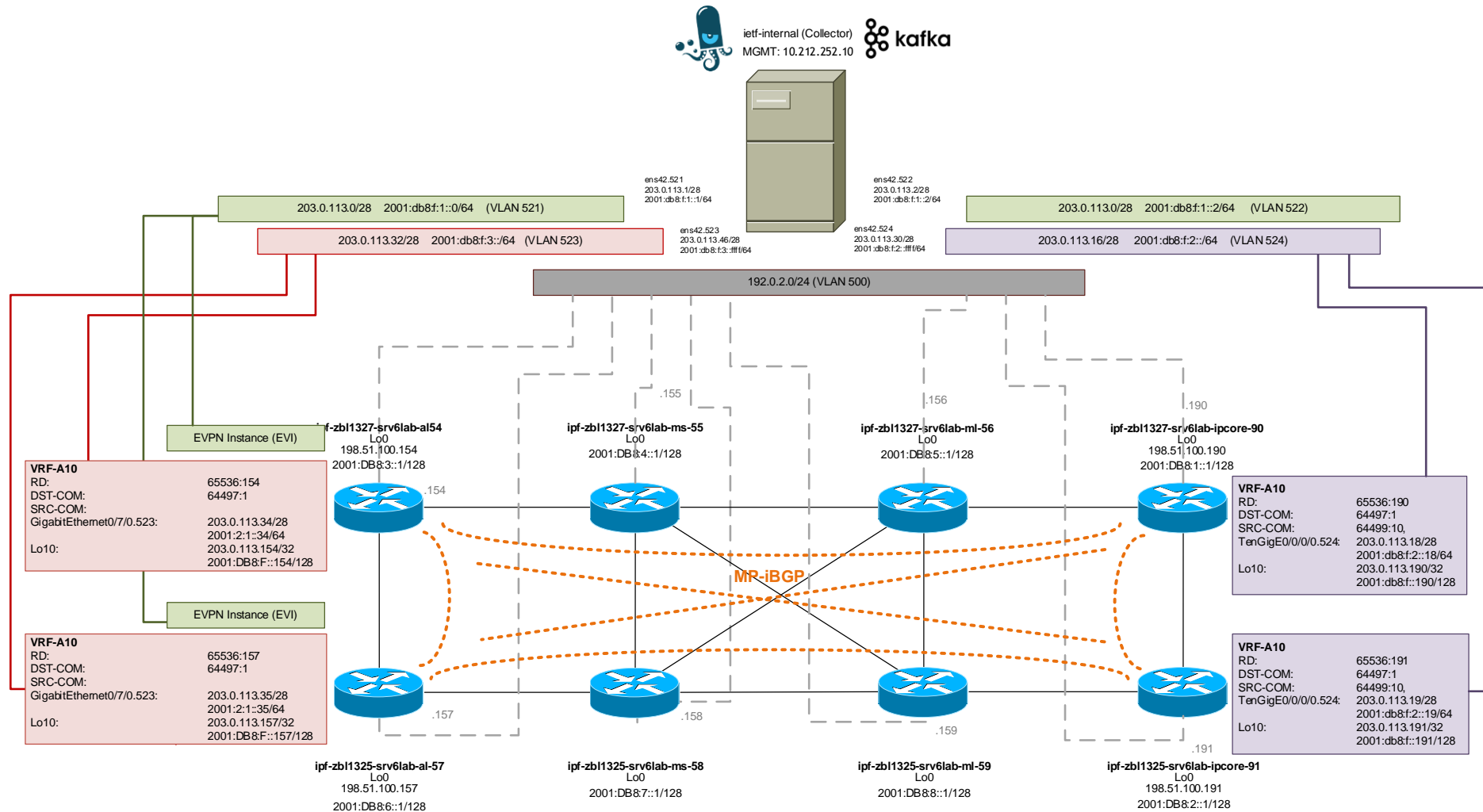
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Huawei VRP implementation status – lab topology



- SRv6 network topology with two vendors and IPFIX data pipeline.
- Huawei with four P and two PE nodes exposing SRH provider data-plane as described in draft-ietf-opsawg-ipfix-srv6-srh.
- Cisco with two PE nodes exposing customer data-plane.

SRv6 @ IPFIX

Huawei VRP implementation status – records exposed

(1) srhActiveSegmentIPv6

128-bit IPv6 address that represents the active SRv6 segment.

(2) srhSegmentIPv6sLeft

8-bit unsigned integer defining the number of route segments remaining to reach the end of the segment list.

(3) srhFlagsIPv6

8-bit flags defined in the SRH.

(4) srhTagIPv6

16-bit tag field defined in the SRH that marks a packet as part of a class or group of packets sharing the same set of properties.

(5) srhSegmentIPv6ListSection

Exposes the SRH Segment List as defined in section 2 of [RFC8754] as series of n octets.

According to A.1.2. Template Record and Data Set with Segment List Section



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Huawei VRP implementation status – options exposed

(1) srhSegmentIPv6

128-bit IPv6 address that represents a SRv6 segment.

(2) srhSegmentLocatorLength

8-bit The number of significant bits. Together with srhSegmentIPv6 it enables the calculation of the SRv6 Locator.

(3) srhSegmentEndpointBehavior

16-bit unsigned integer that represents a SRv6 Endpoint behavior as per Section 4 of [RFC8986].

According to A.2. Options Template Record and Data Set for SRv6 Segment End Point behavior and Locator Length



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Next Steps

- **Missing SRv6 data-plane visibility is a recognized problem.**
- **Open-source running code published.**
- **First commercial vendor implementations will be public end of Q1 and Q3 2023.**
- The authors would like to ask the OPSAWG working group **wherever it beliefs that the document is in stable state to request early code point allocation at IANA** or not.

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