

# Export of Segment Routing IPv6 Information in IPFIX

draft-tgraf-opsawg-ipfix-srv6-srh

Enabling insights in SRv6 forwarding plane  
by adding Segment Routing dimensions

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# SRv6 @ IPFIX

## Data-Plane visibility is missing in SRv6

- SRv6 is already deployed at network operators ([draft-matsushima-spring-srv6-deployment-status](#)). If you know any other network operator which migrated from MPLS to SRv6 yet.
  - > **Feedback welcome**
- Data-Plane visibility is missing in SRv6. Unable to see how much traffic is being forwarded or dropped with which SID. **Network operators flying blind.**
- Segment Routing Header is defined in Section 2 of RFC 8754.

```
File Edit View History Bookmarks Tools Help
RFC 8754 - IPv6 Segment Routin X +
https://datatracker.ietf.org/doc/html/rfc8754#section-2
2. Segment Routing Header
Routing headers are defined in [RFC8200]. The Segment Routing Header (SRH) has a new Routing Type (4).
The SRH is defined as follows:
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
| Next Header | Hdr Ext Len | Routing Type | Segments Left |
| Last Entry | Flags | Tag |
Segment List[0] (128-bit IPv6 address)
...
Segment List[n] (128-bit IPv6 address)
//
// Optional Type Length Value objects (variable)
//
```

# SRv6 @ IPFIX

## IPFIX entities in context of the SRH (1)

- **srhSegmentIPv6sLeft**  
8-bit unsigned integer defining the number of route segments remaining to reach the end of the segment list.
- **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.
- **srhFlagsIPv6**  
8-bit flags defined in the SRH.
- **srhActiveSegmentIPv6Type**  
Name of the routing protocol or PCEP extension from where the active SRv6 segment has been learned from.
- **srhSegmentLocatorLength**  
The number of significant bits. Together with srhSegmentIPv6 it enables the calculation of the SRv6 Locator.
- **srhSegmentEndpointBehavior**  
16-bit unsigned integer that represents a SRv6 Endpoint behavior.

The screenshot shows a browser window displaying the RFC 8754 - IPv6 Segment Routing Header section 2. The page title is "RFC 8754 - IPv6 Segment Routing Header". The URL is "https://datatracker.ietf.org/doc/html/rfc8754#section-2". The section title is "2. Segment Routing Header". The text describes the SRH structure and provides a diagram of the header format. The diagram shows a 32-bit header structure with the following fields: Next Header (8 bits), Hdr Ext Len (8 bits), Routing Type (8 bits), Segments Left (8 bits), Last Entry (1 bit), Flags (8 bits), and Tag (16 bits). Below the diagram, there is a code snippet showing the Segment List structure:

```
//
// Optional Type Length Value objects (variable)
//
Segment List[0] (128-bit IPv6 address)
...
Segment List[n] (128-bit IPv6 address)
```

# SRv6 @ IPFIX

## IPFIX entities in context of the SRH (2)

- **srhSectionIPv6**  
Exposes the SRH and its TLV's as defined in section 2 of [RFC8754] as series of n octets.
- **srhSegmentIPv6ListSection**  
Exposes the SRH Segment List as defined in section 2 of [RFC8754] as series of n octets.
- **srhSegmentIPv6**  
128-bit IPv6 address that represents an SRv6 segment.
- **srhActiveSegmentIPv6**  
128-bit IPv6 address that represents the active SRv6 segment.
- **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.

```
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RFC 8754 - IPv6 Segment Routin X +
https://datatracker.ietf.org/doc/html/rfc8754#section-2

2. Segment Routing Header

Routing headers are defined in [RFC8200]. The Segment Routing Header (SRH) has a new Routing Type (4).

The SRH is defined as follows:

  0                               1                               2                               3
  0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
  +-----+-----+-----+-----+-----+-----+-----+-----+
  | Next Header | Hdr Ext Len | Routing Type | Segments Left |
  +-----+-----+-----+-----+-----+-----+-----+-----+
  | Last Entry  | Flags      | Tag          |
  +-----+-----+-----+-----+-----+-----+-----+

  Segment List[0] (128-bit IPv6 address)
  +-----+-----+-----+-----+-----+-----+-----+-----+
  ...
  +-----+-----+-----+-----+-----+-----+-----+-----+
  Segment List[n] (128-bit IPv6 address)

  //                               //
  //      Optional Type Length Value objects (variable)      //
  //                               //
  +-----+-----+-----+-----+-----+-----+-----+-----+
```

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## Draft Status

- Received comments from SPRING, OPSAWG and other network operators.
- **Addressed all open issues** and double-checked the IANA consideration section with the IPFIX doctors.
- Added "Compressed SRv6 Segment List Decomposition" in operational consideration section
- **srhSegmentLocatorLength** and **srhSegmentEndpointBehavior** has been added and included in the use case and operational section description
- Aligned IE naming according to <https://datatracker.ietf.org/doc/html/rfc7012#section-2.3>
- Updated srhFlagsIPv6 registry
- Added data-template and data-record examples for srhSegmentIPv6ListSection and srhSectionIPv6 in example section

# SRv6 @ IPFIX

## Next Steps

- **Missing SRv6 data-plane visibility is a recognized problem.**
- **2 vendors validated technical feasibility and working on implementations.**
- INSA Lyon working on running open-source code in FD.io VPP. **Will be shown at IETF 115 hackathon.**
- The authors believe that document should progress quickly through IETF to avoid private enterprise code points being used in SRv6 deployments.
- **The authors would like to go call for adoption in OPSAWG (was already requested at IETF 113)**

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