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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MPLS-SR @ IPFIX

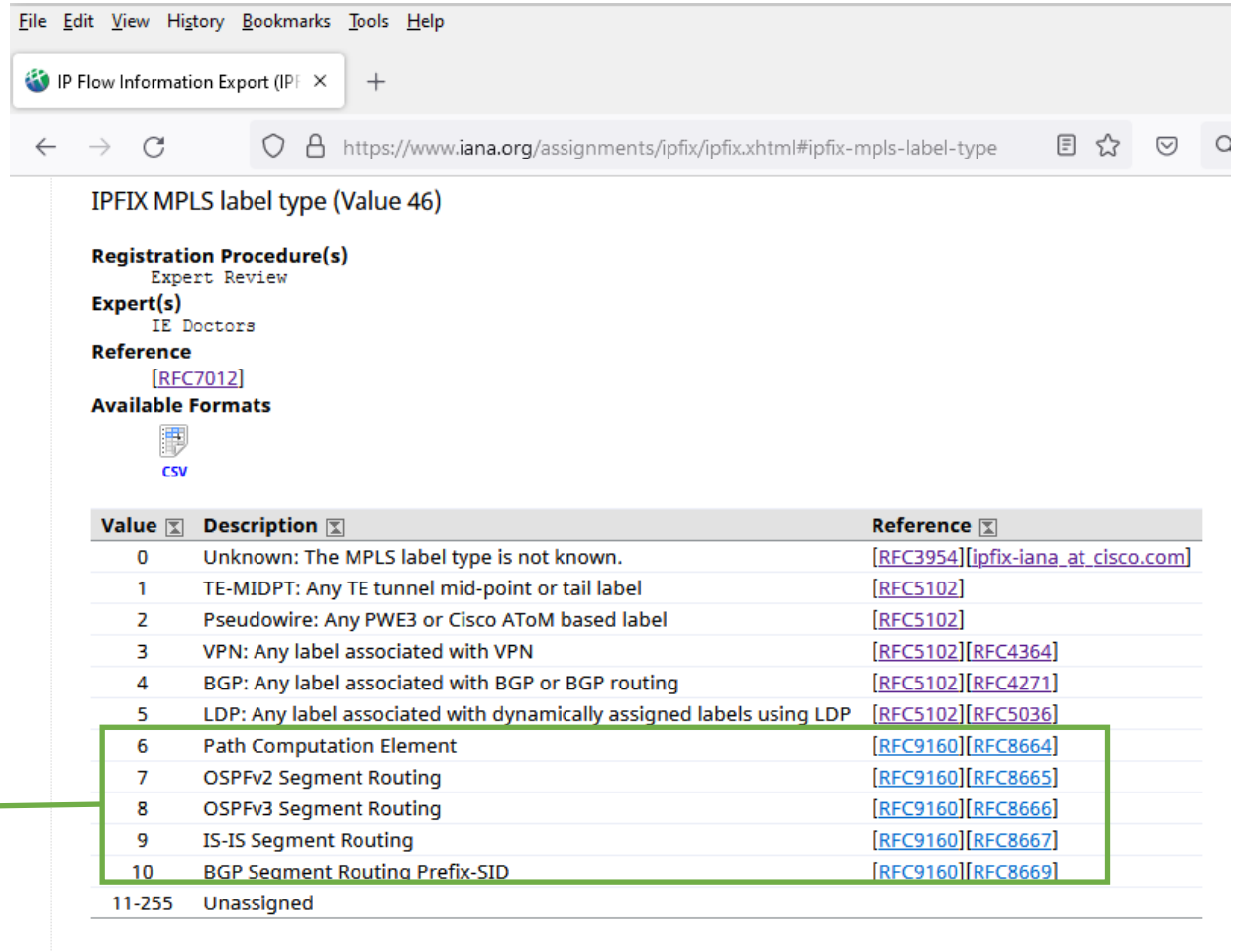
Adressed with RFC 9160 @ OPSAWG

- In MPLS-SR the data-plane is still the same as in MPLS. **Only the routing protocol providing the label changes.**
- IE70 mplsTopLabelStackSection is the top label FEC used to forward. Each following label in the label stack is **decomposed in IE71-79 separately.**

```
 0                   1                   2
 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                Label                  | Exp |S|
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+

Label:  Label Value, 20 bits
Exp:    Experimental Use, 3 bits
S:      Bottom of Stack, 1 bit
```

- IE47 mplsTopLabelIPv4Address is the top label IP address where the traffic is forwarded to.
- IE46 mplsTopLabelType describes from which routing protocol the top label IP address and label is coming from. **Updated with RFC 9160 to cover MPLS-SR routing protocols.**



Value	Description	Reference
0	Unknown: The MPLS label type is not known.	[RFC3954][ipfix-iana_at_cisco.com]
1	TE-MIDPT: Any TE tunnel mid-point or tail label	[RFC5102]
2	Pseudowire: Any PWE3 or Cisco AToM based label	[RFC5102]
3	VPN: Any label associated with VPN	[RFC5102][RFC4364]
4	BGP: Any label associated with BGP or BGP routing	[RFC5102][RFC4271]
5	LDP: Any label associated with dynamically assigned labels using LDP	[RFC5102][RFC5036]
6	Path Computation Element	[RFC9160][RFC8664]
7	OSPFv2 Segment Routing	[RFC9160][RFC8665]
8	OSPFv3 Segment Routing	[RFC9160][RFC8666]
9	IS-IS Segment Routing	[RFC9160][RFC8667]
10	BGP Segment Routing Prefix-SID	[RFC9160][RFC8669]
11-255	Unassigned	

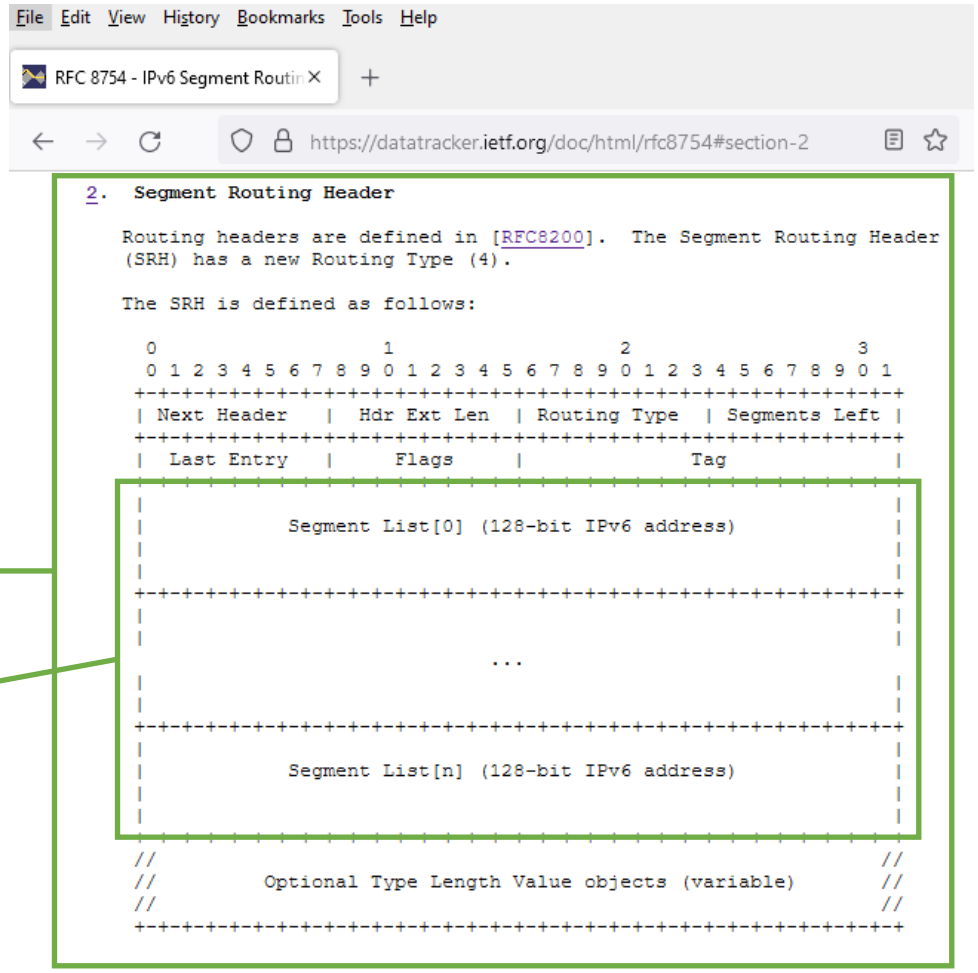
SRv6 @ IPFIX

Adressed with draft-tgraf-opsawg-ipfix-srv6-srh

- SRv6 is already deployed at network operators (draft-matsushima-spring-srv6-deployment-status). Unaware of any network operator 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.
- Segment List doesn't change with draft-ietf-spring-srv6-srh-compression. It is still IPv6 addressed. Context to routing protocol however is important to understand decomposition.



SRv6 @ IPFIX

Adressed with draft-tgraf-opsawg-ipfix-srv6-srh

- **ipv6SRHSegmentsLeft**

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

- **ipv6SRHTag**

  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.

- **ipv6SRHFlags**

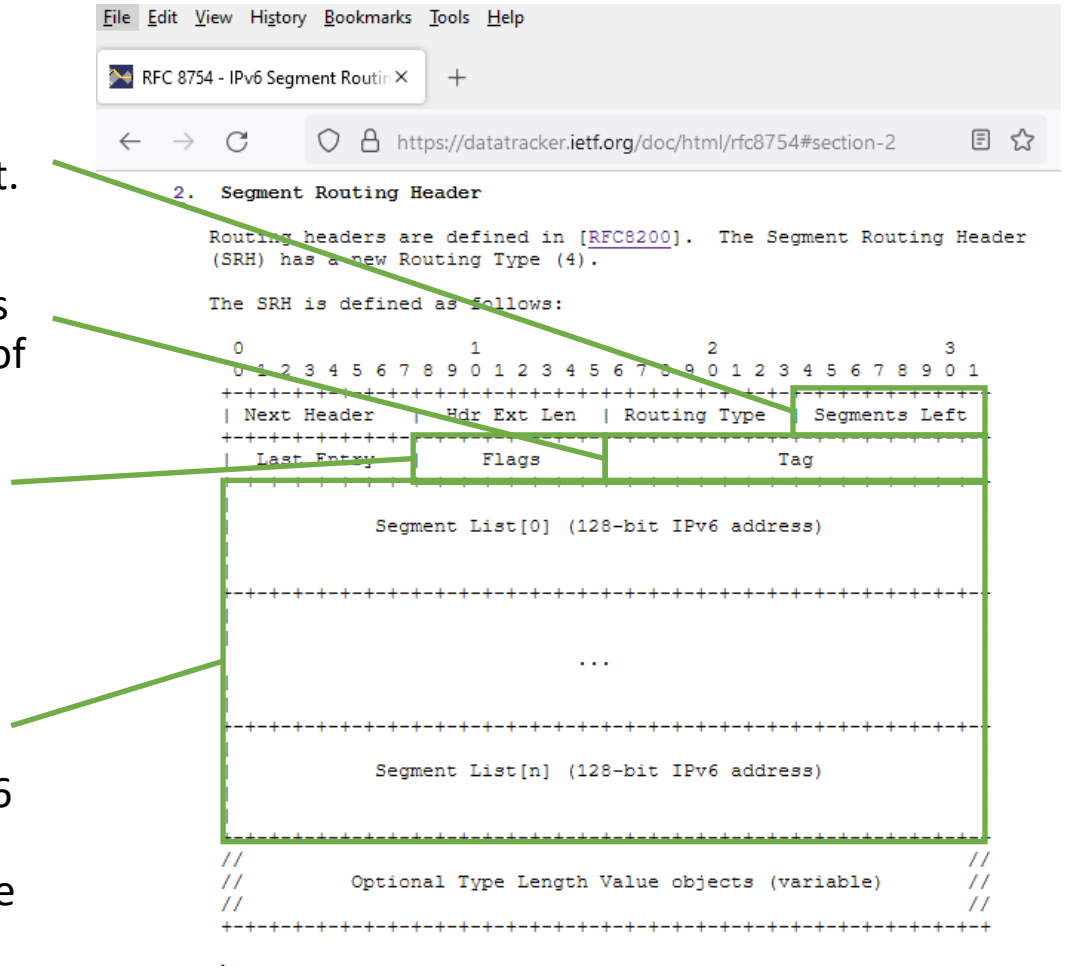
  8-bit flags defined in the SRH.

- **ipv6SRHSegment**

  128-bit IPv6 address that represents an SRv6 segment.

- **ipv6SRHSegmentBasicList**

  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.



SRv6 @ IPFIX

Adressed with draft-tgraf-opsawg-ipfix-srv6-srh

- **ipv6SRHSection**

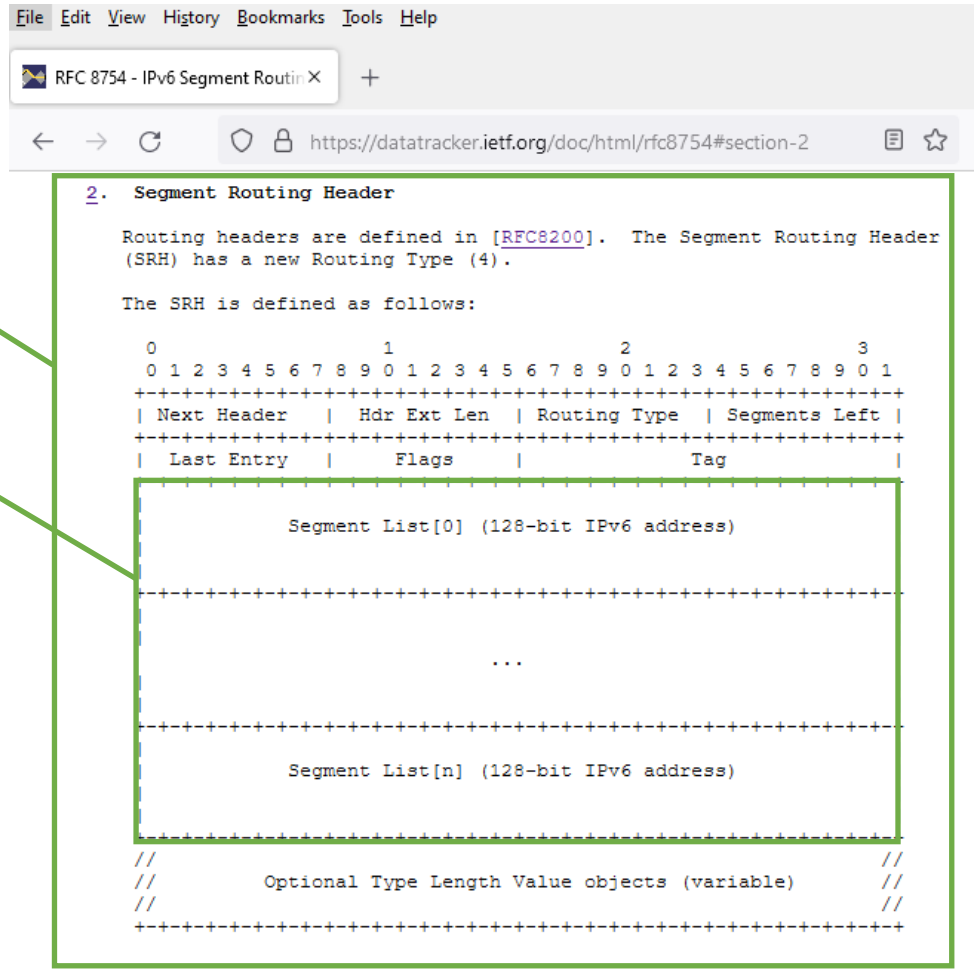
  Exposes the SRH and its TLV's as defined in section 2 of [RFC8754] as series of n octets.

- **ipv6SRHSegmentListSection**

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

- **ipv6SRHSegmentType**

  Name of the routing protocol or PCEP extension from where the active SRv6 segment has been learned from.



SRv6 @ IPFIX

Draft Status

- Feedback collected from SPRING, OPSAWG and IPFIX doctor.
- ipv6SRHSection and ipv6SRHSegmentListSection added to allow export of entire SRH and Segment List in one IPFIX entity.
- ipv6SRHSegmentsLeft added to express at which position of the Segment List the forwarding happens.
- Added operational considerations section to describe when ipv6SRHSection and ipv6SRHSegmentListSection makes sense.
- Updated IANA considerations to be in line with RFC 8126.
- The document doesn't introduce any new protocols. It is for documentation purposes. However, because new IPFIX registries are introduced, it is required to be an Internet standard document.
- Authors believe that document should progress quickly through IETF to avoid private enterprise code points being used in SRv6 deployments.

-> Call for adoption at OPSAWG at IETF 113

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