

Export of MPLS-SR Label Type Information in IPFIX

Enabling insights in MPLS-SR forwarding plane
by adding Segment Routing dimensions

thomas.graf@swisscom.com

13. June 2020

MPLS-SR @ IPFIX

Vendor Status

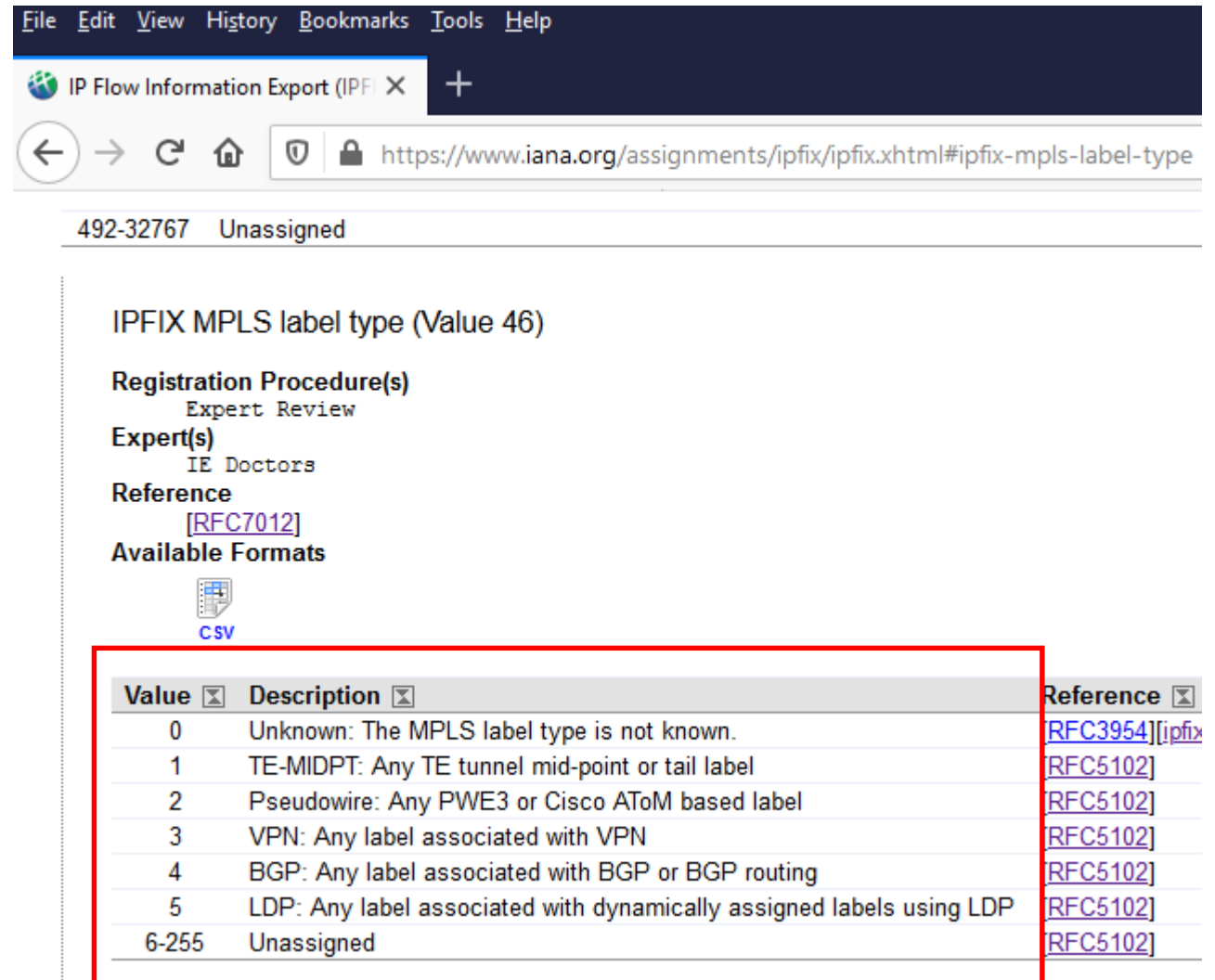
- MPLS-SR uses the existing MPLS data plane.
- Therefore, looking how IPFIX metrics are exposed at a current MPLS-SR vendor implementation we see **not much of a difference to classical MPLS**.
- Looking more deeply, **we notice "not much" is pretty much what is missing**.
- mplsTopLabelType is referencing LDP even though there isn't any LDP anymore. -> Funny

```
> Frame 527: 182 bytes on wire (1456 bits), 182 bytes captured (1456 bits)
> Ethernet II, Src: Cisco_ea:ad:1c (00:32:17:ea:ad:1c), Dst: Vmware_21:95:d2 (00:0c:29:21:95:d2)
> Internet Protocol Version 4, Src: 138.187.57.63, Dst: 138.187.58.13
> User Datagram Protocol, Src Port: 44542, Dst Port: 9991
▼ Cisco NetFlow/IPFIX
  Version: 9
  Count: 1
  SysUptime: 516154.381000000 seconds
  > Timestamp: Feb 23, 2020 13:57:18.000000000 W. Europe Standard Time
  FlowSequence: 23685
  SourceId: 0
  ▼ FlowSet 1 [id=313] (1 flows)
    FlowSet Id: (Data) (313)
    FlowSet Length: 120
    [Template Frame: 9]
    ▼ Flow 1
      > MPLS-Label1: 17002 exp-bits: 0
      > MPLS-Label2: 24622 exp-bits: 0 bottom-of-stack
      > MPLS-Label3: 0 exp-bits: 0
      > MPLS-Label4: 0 exp-bits: 0
      > MPLS-Label5: 0 exp-bits: 0
      > MPLS-Label6: 0 exp-bits: 0
      InputInt: 87
      OutputInt: 111
      Octets: 216000
      Packets: 2000
      > [Duration: 5.753000000 seconds (switched)]
      TopLabelAddr: 138.187.57.13
      SrcAddr: ::
      DstAddr: ::
      ipv6FlowLabel: 0
      IPv6 Extension Headers: 0x00000000
      SrcAddr: 10.248.4.236
      DstAddr: 10.248.4.222
      SrcPort: 0
      DstPort: 2048
      MPLS Top Label Prefix Length: 32
      TopLabelType: LDP (5)
      > Forwarding Status
      Direction: Ingress (0)
      IP ToS: 0x00
      Protocol: ICMP (1)
      > TCP Flags: 0x00
      SamplerID: 1
      Ingress VRFID: 1610612736
      Egress VRFID: 1610612736
      Padding: 0000
```

MPLS-SR @ IPFIX

IANA Status

- Looking at IANA makes it clear, there is **NO** mplsTopLabelType code point for IS-IS, OSPFv2 and OSPFv3 Segment Routing.



The screenshot shows a web browser window with the URL <https://www.iana.org/assignments/ipfix/ipfix.xhtml#ipfix-mpls-label-type>. The page title is "IPFIX MPLS label type (Value 46)". The registration procedure is "Expert Review" and the expert is "IE Doctors". The reference is "[RFC7012]". The available format is "CSV".

Value	Description	Reference
0	Unknown: The MPLS label type is not known.	RFC3954 [ipfix]
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
4	BGP: Any label associated with BGP or BGP routing	RFC5102
5	LDP: Any label associated with dynamically assigned labels using LDP	RFC5102
6-255	Unassigned	RFC5102

MPLS-SR @ IPFIX

RFC 8402, SID's, SID's

- Segment Routing is all about SID's.
- An Adjacency-SID can be used by TI-LFA or uLoop avoidance to use a different path to the Prefix SID than what the routing protocol calculated as best path.
- Where are the SID's in IPFIX?
-> **Nowhere!**

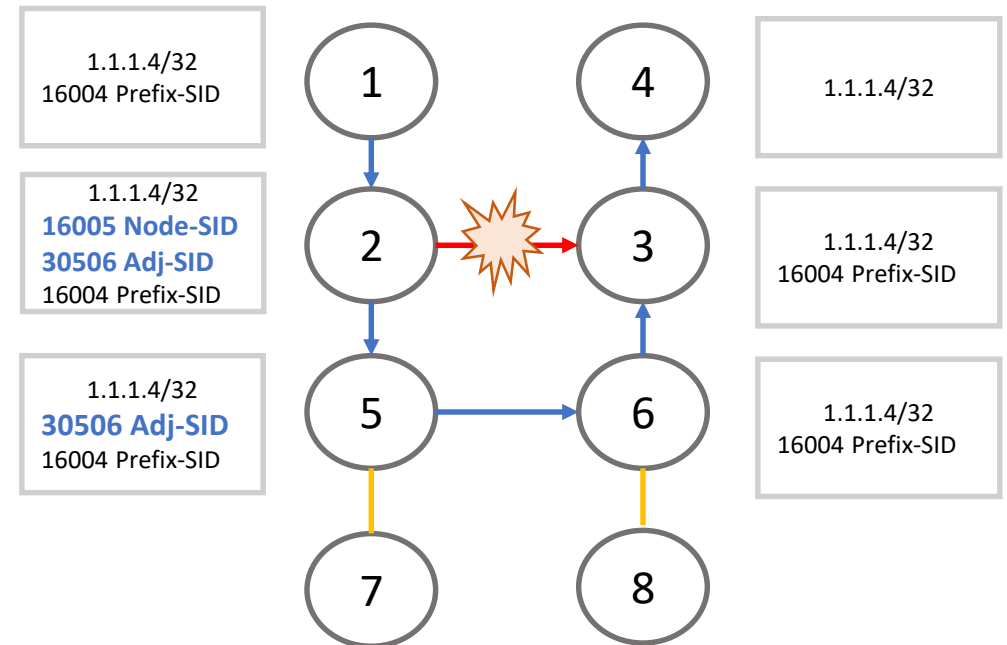
Table of Contents

1.	Introduction	3
2.	Terminology	6
3.	Link-State IGP Segments	9
3.1.	IGP-Prefix Segment (Prefix-SID)	9
3.1.1.	Prefix-SID Algorithm	9
3.1.2.	SR-MPLS	10
3.1.3.	SRv6	12
3.2.	IGP-Node Segment (Node-SID)	13
3.3.	IGP-Anycast Segment (Anycast-SID)	13
3.3.1.	Anycast-SID in SR-MPLS	13
3.4.	IGP-Adjacency Segment (Adj-SID)	15
3.4.1.	Parallel Adjacencies	17
3.4.2.	LAN Adjacency Segments	18
3.5.	Inter-Area Considerations	18
4.	BGP Segments	19
4.1.	BGP-Prefix Segment	19
4.2.	BGP Peering Segments	20
5.	Binding Segment	21
5.1.	IGP Mirroring Context Segment	21
6.	Multicast	22
7.	IANA Considerations	22
8.	Security Considerations	22
8.1.	SR-MPLS	22
8.2.	SRv6	24
8.3.	Congestion Control	25
9.	Manageability Considerations	25
10.	References	26
10.1.	Normative References	26
10.2.	Informative References	27
	Acknowledgements	30
	Contributors	31
	Authors' Addresses	32

MPLS-SR @ IPFIX

draft-tgraf-ipfix-mpls-sr-label-type

- Segment Routing adds the source routing paradigm to MPLS and enhances IGP routing protocol to carry label information.
- Let's bring visibility into **how Segment Routing applications change the MPLS forwarding plane**.
- "Show me all MPLS-SR controlled traffic where Adj-SID's were used, group by Label Stack, and show for each through which nodes and interfaces it was forwarded."
- Fill the missing gaps at IPFIX:
 - Update **mplsTopLabelType**
 - Introduce **SrSidType**



Feedback collected from SPRING and OPSAWG lists, submitted to IANA and received review from IE-DOCTOR...

-> Call for adoption at OPSWAG

thomas.graf@swisscom.com

13. June 2020