Stream: Internet Engineering Task Force (IETF)
RFC: 9160
Category: Informational
Published: December 2021
ISSN: 2070-1721
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RFC 9160
Export of MPLS Segment Routing Label Type Information in IP Flow Information Export (IPFIX)

Abstract

This document introduces new IP Flow Information Export (IPFIX) code points to identify which traffic is being forwarded based on which MPLS control plane protocol is used within a Segment Routing domain. In particular, this document defines five code points for the IPFIX mplsTopLabelType Information Element for Path Computation Element (PCE), IS-IS, OSPFv2, OSPFv3, and BGP MPLS Segment Routing extensions.

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Table of Contents

1. Introduction

Four routing protocol extensions -- OSPFv2 Extensions [RFC8665], OSPFv3 Extensions [RFC8666], IS-IS Extensions [RFC8667], and BGP Prefix Segment Identifiers (Prefix-SIDs) [RFC8669] -- and one Path Computation Element Communication Protocol (PCEP) Extension [RFC8664] have been defined to be able to propagate Segment Routing (SR) labels for the MPLS data plane [RFC8660].

Also, [SR-Traffic-Accounting] describes how IP Flow Information Export (IPFIX) [RFC7012] can be leveraged in dimensional data modeling to account for traffic to MPLS SR label dimensions within a Segment Routing domain.

In [RFC7012], the Information Element (IE) mplsTopLabelType(46) identifies which MPLS control plane protocol allocated the top-of-stack label in the MPLS label stack. Per Section 7.2 of [RFC7012], the "IPFIX MPLS label type (Value 46)" subregistry [IANA-IPFIX] was created, where new MPLS label type entries should be added. This document defines new code points to address typical use cases that are discussed in Section 2.

2. MPLS Segment Routing Top Label Type

By introducing five new code points to the IPFIX IE mplsTopLabelType(46) for Path Computation Element (PCE), IS-IS, OSPFv2, OSPFv3, and BGP Prefix-SIDs, it is possible to identify which traffic is being forwarded based upon which MPLS SR control plane protocol is in use.

A typical use case is to monitor MPLS control plane migrations from LDP to IS-IS or OSPF Segment Routing. Such a migration can be done node by node as described in Appendix A of [RFC8661].

Another use case is to monitor MPLS control plane migrations from dynamic BGP labels [RFC8277] to BGP Prefix-SIDs [RFC8669]. For example, the motivation for, and benefits of, such a migration in large-scale data centers are described in [RFC8670].

Both use cases can be verified by using mplsTopLabelType(46), mplsTopLabelIPv4Address(47), mplsTopLabelIPv6Address(140), mplsTopLabelStackSection(70), and forwardingStatus(89) IEs to infer

- how many packets are forwarded or dropped
- if packets are dropped, for which reasons, and
- the MPLS provider edge loopback address and label protocol

By looking at the MPLS label value itself, it is not always clear to which label protocol it belongs. This is because they may share the same label allocation range. This is, for example, the case for IGP-Adjacency SIDs, LDP, and dynamic BGP labels.

3. IANA Considerations

IANA has allocated the following code points in the "IPFIX MPLS label type (Value 46)" subregistry within the "IPFIX Information Elements" registry [RFC7012]. See [IANA-IPFIX].

Value	Description	Reference
6	Path Computation Element	RFC 9160, RFC 8664
7	OSPFv2 Segment Routing	RFC 9160, RFC 8665
8	OSPFv3 Segment Routing	RFC 9160, RFC 8666
9	IS-IS Segment Routing	RFC 9160, RFC 8667
10	BGP Segment Routing Prefix-SID	RFC 9160, RFC 8669

Table 1: Updates to "IPFIX MPLS label type (Value 46)" Subregistry

References to RFCs 4364, 4271, and 5036 have been added to the "Reference" column in the "IPFIX MPLS label type (Value 46)" subregistry [IANA-IPFIX] for code points 3, 4, and 5, respectively. Previously, these references appeared in the "Additional Information" column for mplsTopLabelType(46) in the "IPFIX Information Elements" registry [IANA-IPFIX].

4. Operational Considerations

In the IE mplsTopLabelType(46), BGP code point 4 refers to the label value in the MP_REACH_NLRI path attribute described in Section 2 of [RFC8277], while BGP Segment Routing Prefix-SID code point 10 corresponds to the label index value in the Label-Index TLV described in Section 3.1 of [RFC8669]. These values are thus used for those distinct purposes.

5. Security Considerations

There exist no significant extra security considerations regarding the allocation of these new IPFIX IEs as compared to [RFC7012].

6. References

6.1. Normative References

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Acknowledgements

I would like to thank the IE doctors, Paul Aitken and Andrew Feren, as well as Benoît Claise, Loa Andersson, Tianran Zhou, Pierre François, Bruno Decraene, Paolo Lucente, Hannes Gredler, Ketan Talaulikar, Sabrina Tanamal, Erik Auerswald, Sergey Fomin, Mohamed Boucadair, Tom Petch, Qin Wu, and Matthias Arnold for their review and valuable comments. Many thanks also to Robert Wilton for the AD review. Thanks to Alvaro Retana, Éric Vyncke, and Benjamin Kaduk for the IESG review.

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