

Interdomain Routing Working Group
Internet-Draft
Intended status: Standards Track
Expires: July 9, 2020

F. Qin
China Mobile
H. Yuan
UnionPay
T. Zhou
M. Liu
G. Fioccola
Huawei
January 6, 2020

BGP SR Policy Extensions to Enable IFIT
draft-qin-idr-sr-policy-ifat-00

Abstract

Segment Routing (SR) policy is a set of candidate SR paths consisting of one or more segment lists and necessary path attributes. It enables instantiation of an ordered list of segments with a specific intent for traffic steering. In-situ Flow Information Telemetry (IFIT) provides a reference framework that supports network OAM applications to apply dataplane on-path telemetry techniques acquiring data about a packet on its forwarding path. This document defines extensions to BGP to distribute SR policies carrying IFIT information. So that IFIT behavior can be enabled automatically when the SR policy is applied.

Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in [RFC 2119](#) [[RFC2119](#)].

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of [BCP 78](#) and [BCP 79](#).

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at <https://datatracker.ietf.org/drafts/current/>.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on July 9, 2020.

Copyright Notice

Copyright (c) 2020 IETF Trust and the persons identified as the document authors. All rights reserved.

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<https://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the Trust Legal Provisions and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1.	Introduction	2
2.	IFIT Attributes in SR Policy	3
3.	SR Policy for IOAM	4
3.1.	IOAM Pre-allocated Trace Option Sub-TLV	4
3.2.	IOAM Incremental Trace Option Sub-TLV	5
3.3.	IOAM Directly Export Option Sub-TLV	6
3.4.	IOAM Edge-to-Edge Option Sub-TLV	7
4.	SR Policy for Enhanced Alternate Marking	8
5.	IANA Considerations	9
6.	Security Considerations	9
7.	Acknowledgements	9
8.	References	9
8.1.	Normative References	9
8.2.	Informative References	9
Appendix A.	11
Authors' Addresses	11

[1.](#) Introduction

Segment Routing (SR) policy [[I-D.ietf-spring-segment-routing-policy](#)] is a set of candidate SR paths consisting of one or more segment lists and necessary path attributes. It enables instantiation of an ordered list of segments with a specific intent for traffic steering.

In-situ Flow Information Telemetry (IFIT)

[[I-D.song-opsawg-ifit-framework](#)] provides a reference framework that supports network OAM applications to apply dataplane on-path telemetry techniques, including In-situ OAM (IOAM)

[[I-D.ietf-ippm-ioam-data](#)], Postcard Based Telemetry (PBT)

[[I-D.song-ippm-postcard-based-telemetry](#)], In-band Flow Analyzer (IFA) [[I-D.kumar-ippm-ifa](#)], Enhanced Alternate Marking (EAM) [[I-D.zhou-ippm-enhanced-alternate-marking](#)], and Hybrid Two Steps (HTS) [[I-D.mirsky-ippm-hybrid-two-step](#)]. It can provide flow information on the entire forwarding path on a per- packet basis in real time.

An automatic network requires the Service Level Agreement (SLA) monitoring on the deployed service. So that the system can quickly detect the SLA violation or the performance degradation, hence to change the service deployment. The SR policy native IFIT can facilitate the closed loop control, and enable the automation of SR service.

This document defines extensions to BGP to distribute SR policies carrying IFIT information. So that IFIT behavior can be enabled automatically when the SR policy is applied.

2. IFIT Attributes in SR Policy

As defined in [[I-D.ietf-idr-segment-routing-te-policy](#)], the SR Policy encoding structure is as follows:

SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>

Attributes:

 Tunnel Encaps Attribute (23)

 Tunnel Type: SR Policy

 Binding SID

 Preference

 Priority

 Policy Name

 Explicit NULL Label Policy (ENLP)

 Segment List

 Weight

 Segment

 Segment

 ...

 ...

A candidate path includes multiple SR paths, each of which is specified by a segment list. IFIT can be applied to the candidate path, so that all the SR paths can be monitored in the same way. The new SR Policy encoding structure is expressed as below:

SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>

Attributes:

 Tunnel Encaps Attribute (23)

 Tunnel Type: SR Policy

 Binding SID

 Preference

 Priority

 Policy Name

 Explicit NULL Label Policy (ENLP)

 IFIT Attributes

 Segment List

 Weight

 Segment

 Segment

 ...

 ...

IFIT attributes can be attached at the candidate path level as sub-TLVs. There may be different IFIT tools. The following sections will describe the requirement and usage of different IFIT tools, and define the corresponding sub-TLV encoding in BGP.

3. SR Policy for IOAM

In-situ Operations, Administration, and Maintenance (IOAM)

[[I-D.ietf-ippm-ioam-data](#)] records operational and telemetry information in the packet while the packet traverses a path between two points in the network. In terms of the classification given in [RFC 7799](#) [[RFC7799](#)] IOAM could be categorized as Hybrid Type 1. IOAM mechanisms can be leveraged where active OAM do not apply or do not offer the desired results.

When SR policy enables the IOAM, the IOAM header will be inserted into every packet of the traffic that is steered into the SR paths.

[3.1.](#) IOAM Pre-allocated Trace Option Sub-TLV

The IOAM tracing data is expected to be collected at every node that a packet traverses to ensure visibility into the entire path a packet takes within an IOAM domain. The preallocated tracing option will create pre-allocated space for each node to populate its information.

The format of IOAM pre-allocated trace option sub-TLV is defined as follows:

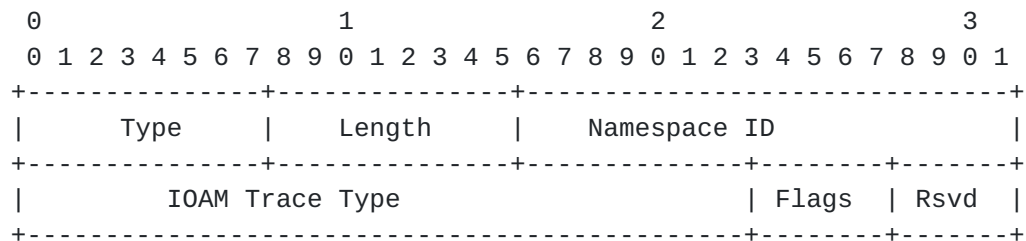


Fig. 1 IOAM Pre-allocated Trace Option Sub-TLV

Where:

Type: to be assigned by IANA.

Length: the total length of the value field not including Type and Length fields.

Namespace ID: A 16-bit identifier of an IOAM-Namespace. The definition is the same as described in section 4.4 of [\[I-D.ietf-ippm-ioam-data\]](#).

IOAM Trace Type: A 24-bit identifier which specifies which data types are used in the node data list. The definition is the same as described in section 4.4 of [\[I-D.ietf-ippm-ioam-data\]](#).

Flags: A 4-bit field. The definition is the same as described in [\[I-D.ietf-ippm-ioam-flags\]](#) and section 4.4 of [\[I-D.ietf-ippm-ioam-data\]](#).

Rsvd: A 4-bit field reserved for further usage. It MUST be zero.

3.2. IOAM Incremental Trace Option Sub-TLV

The incremental tracing option contains a variable node data fields where each node allocates and pushes its node data immediately following the option header.

The format of IOAM incremental trace option sub-TLV is defined as follows:

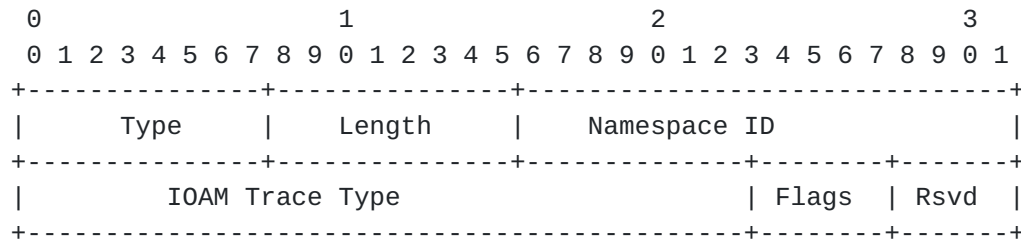


Fig. 2 IOAM Incremental Trace Option Sub-TLV

Where:

Type: to be assigned by IANA.

Length: the total length of the value field not including Type and Length fields.

All the other fields definition is the same as the pre-allocated trace option sub-TLV in [section 4.1](#).

3.3. IOAM Directly Export Option Sub-TLV

IOAM directly export option is used as a trigger for IOAM data to be directly exported to a collector without being pushed into in-flight data packets.

The format of IOAM directly export option sub-TLV is defined as follows:

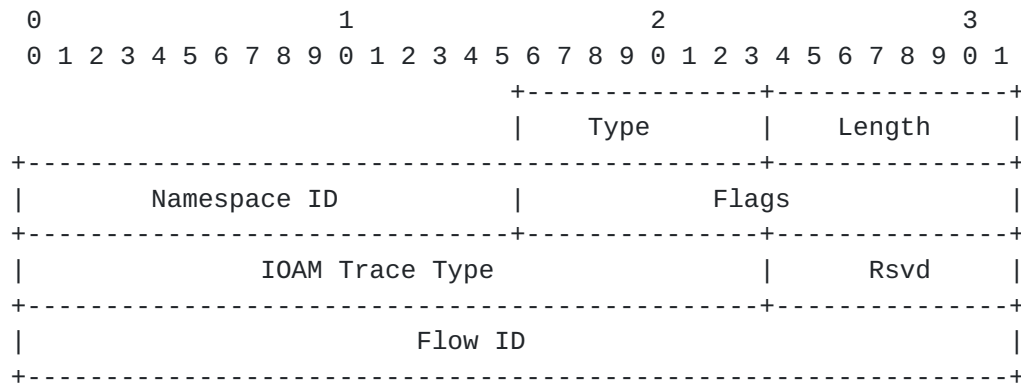


Fig. 3 IOAM Directly Export Option Sub-TLV

Where:

Type: to be assigned by IANA.

Length: the total length of the value field not including Type and Length fields.

Namespace ID: A 16-bit identifier of an IOAM-Namespace. The definition is the same as described in section 4.4 of [\[I-D.ietf-ippm-ioam-data\]](#).

IOAM Trace Type: A 24-bit identifier which specifies which data types are used in the node data list. The definition is the same as described in section 4.4 of [\[I-D.ietf-ippm-ioam-data\]](#).

Flags: A 16-bit field. The definition is the same as described in section 3.2 of [\[I-D.ioamteam-ippm-ioam-direct-export\]](#).

Flow ID: A 32-bit flow identifier. The definition is the same as described in section 3.2 of [\[I-D.ioamteam-ippm-ioam-direct-export\]](#).

Rsvd: A 4-bit field reserved for further usage. It MUST be zero.

3.4. IOAM Edge-to-Edge Option Sub-TLV

The IOAM edge to edge option is to carry data that is added by the IOAM encapsulating node and interpreted by IOAM decapsulating node.

The format of IOAM edge-to-edge option sub-TLV is defined as follows:

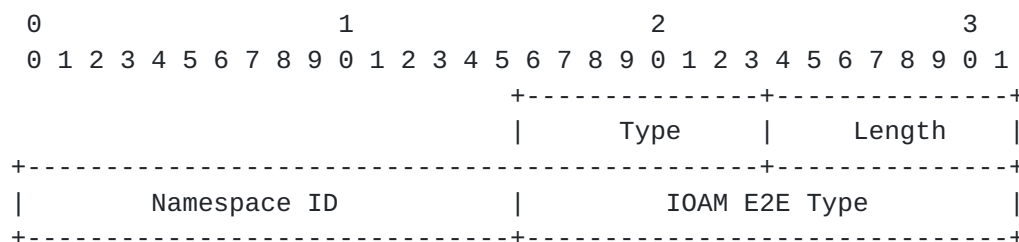


Fig. 4 IOAM Edge-to-Edge Option Sub-TLV

Where:

Type: to be assigned by IANA.

Length: the total length of the value field not including Type and Length fields.

Namespace ID: A 16-bit identifier of an IOAM-Namespace. The definition is the same as described in section 4.6 of [\[I-D.ietf-ippm-ioam-data\]](#).

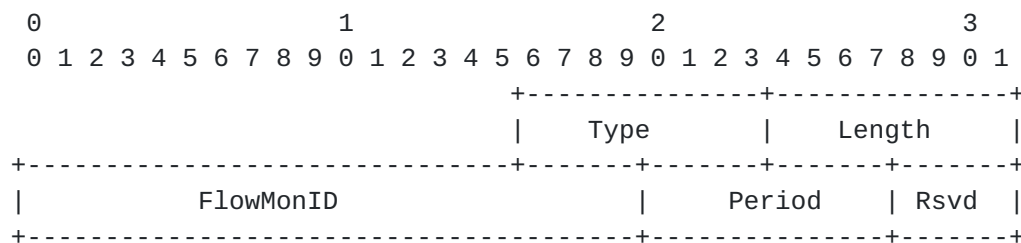
IOAM E2E Type: A 16-bit identifier which specifies which data types are used in the E2E option data. The definition is the same as described in section 4.6 of [[I-D.ietf-ippm-ioam-data](#)].

4. SR Policy for Enhanced Alternate Marking

The Alternate Marking [[RFC8321](#)] technique is an hybrid performance measurement method, per [RFC 7799](#) [[RFC7799](#)] classification of measurement methods. Because this method is based on marking consecutive batches of packets. It can be used to measure packet loss, latency, and jitter on live traffic.

The Enhanced Alternate Marking (EAM) [[I-D.zhou-ippm-enhanced-alternate-marking](#)] defines data fields for the alternate marking with enough space, in particular for Postcard-based Telemetry. More information can be considered within the alternate marking field to facilitate the efficiency and ease the deployment.

The format of EAM sub-TLV is defined as follows:



Where:

Type: to be assigned by IANA.

Length: the total length of the value field not including Type and Length fields.

FlowMonID: A 20-bit identifier to uniquely identify a monitored flow within the measurement domain. The definition is the same as described in section 2 of [[I-D.zhou-ippm-enhanced-alternate-marking](#)].

Period: Time interval between two alternate marking period. The unit is second.

Rsvd: A 4-bit field reserved for further usage. It MUST be zero.

5. IANA Considerations

This document defines new sub-TLVs in the registry "BGP Tunnel Encapsulation Attribute sub-TLVs" to be assigned by IANA:

Codepoint	Description	Reference
TBD1	IOAM Pre-allocated Trace Option Sub-TLV	This document
TBD2	IOAM Incremental Trace Option Sub-TLV	This document
TBD3	IOAM Directly Export Option Sub-TLV	This document
TBD4	IOAM Edge-to-Edge Option Sub-TLV	This document
TBD5	Enhanced Alternate Marking Sub-TLV	This document

6. Security Considerations

TBD.

7. Acknowledgements

8. References

8.1. Normative References

- [RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", [BCP 14](#), [RFC 2119](#), DOI 10.17487/RFC2119, March 1997, <<https://www.rfc-editor.org/info/rfc2119>>.
- [RFC7799] Morton, A., "Active and Passive Metrics and Methods (with Hybrid Types In-Between)", [RFC 7799](#), DOI 10.17487/RFC7799, May 2016, <<https://www.rfc-editor.org/info/rfc7799>>.
- [RFC8321] Fioccola, G., Ed., Capello, A., Cociglio, M., Castaldelli, L., Chen, M., Zheng, L., Mirsky, G., and T. Mizrahi, "Alternate-Marking Method for Passive and Hybrid Performance Monitoring", [RFC 8321](#), DOI 10.17487/RFC8321, January 2018, <<https://www.rfc-editor.org/info/rfc8321>>.

8.2. Informative References

[I-D.ietf-idr-segment-routing-te-policy]

Previdi, S., Filsfils, C., Talaulikar, K., Mattes, P., Rosen, E., Jain, D., and S. Lin, "Advertising Segment Routing Policies in BGP", [draft-ietf-idr-segment-routing-te-policy-08](#) (work in progress), November 2019.

[I-D.ietf-ippm-ioam-data]

Brockners, F., Bhandari, S., Pignataro, C., Gredler, H., Leddy, J., Youell, S., Mizrahi, T., Mozes, D., Lapukhov, P., remy@barefootnetworks.com, r., daniel.bernier@bell.ca, d., and J. Lemon, "Data Fields for In-situ OAM", [draft-ietf-ippm-ioam-data-08](#) (work in progress), October 2019.

[I-D.ietf-ippm-ioam-flags]

Mizrahi, T., Brockners, F., Bhandari, S., Sivakolundu, R., Pignataro, C., Kfir, A., Gafni, B., Spiegel, M., and J. Lemon, "In-situ OAM Flags", [draft-ietf-ippm-ioam-flags-00](#) (work in progress), October 2019.

[I-D.ietf-spring-segment-routing-policy]

Filsfils, C., Sivabalan, S., Voyer, D., Bogdanov, A., and P. Mattes, "Segment Routing Policy Architecture", [draft-ietf-spring-segment-routing-policy-06](#) (work in progress), December 2019.

[I-D.ioamteam-ippm-ioam-direct-export]

Song, H., Gafni, B., Zhou, T., Li, Z., Brockners, F., Bhandari, S., Sivakolundu, R., and T. Mizrahi, "In-situ OAM Direct Exporting", [draft-ioamteam-ippm-ioam-direct-export-00](#) (work in progress), October 2019.

[I-D.kumar-ippm-ifa]

Kumar, J., Anubolu, S., Lemon, J., Manur, R., Holbrook, H., Ghanwani, A., Cai, D., Ou, H., and L. Yizhou, "Inband Flow Analyzer", [draft-kumar-ippm-ifa-01](#) (work in progress), February 2019.

[I-D.mirsky-ippm-hybrid-two-step]

Mirsky, G., Lingqiang, W., and G. Zhui, "Hybrid Two-Step Performance Measurement Method", [draft-mirsky-ippm-hybrid-two-step-04](#) (work in progress), October 2019.

[I-D.song-ippm-postcard-based-telemetry]

Song, H., Zhou, T., Li, Z., Shin, J., and K. Lee, "Postcard-based On-Path Flow Data Telemetry", [draft-song-ippm-postcard-based-telemetry-06](#) (work in progress), October 2019.

[I-D.song-opsawg-ifat-framework]

Song, H., Qin, F., Chen, H., Jin, J., and J. Shin, "In-situ Flow Information Telemetry", [draft-song-opsawg-ifat-framework-10](#) (work in progress), December 2019.

[I-D.zhou-ippm-enhanced-alternate-marking]

Zhou, T., Fioccola, G., Li, Z., Lee, S., and M. Cociglio, "Enhanced Alternate Marking Method", [draft-zhou-ippm-enhanced-alternate-marking-04](#) (work in progress), October 2019.

Appendix A.

Authors' Addresses

Fengwei Qin
China Mobile
No. 32 Xuanwumenxi Ave., Xicheng District
Beijing
China

Email: qinfengwei@chinamobile.com

Hang Yuan
UnionPay
1899 Gu-Tang Rd., Pudong
Shanghai
China

Email: yuanhang@unionpay.com

Tianran Zhou
Huawei
156 Beiqing Rd., Haidian District
Beijing
China

Email: zhoutianran@huawei.com

Min Liu
Huawei
156 Beiqing Rd., Haidian District
Beijing
China

Email: lucy.liumin@huawei.com

Giuseppe Fioccola
Huawei
Riesstrasse, 25
Munich
Germany

Email: giuseppe.fioccola@huawei.com

