

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

C. Li
Huawei Technologies
H. Chen
China Telecom
M. Chen
J. Dong
Z. Li
Huawei Technologies
August 8, 2019

SR Policies Extensions for Path Segment and Bidirectional Path in BGP-LS
[draft-li-idr-bgp-ls-sr-policy-path-segment-03](#)

Abstract

This document specifies the way of collecting configuration and states of SR policies carrying Path Segment and bidirectional path information by using BGP-LS. Such information can be used by external components for many use cases such as performance measurement, path re-optimization and end-to-end protection.

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 February 9, 2020.

Internet-Draft Path ID and Bi-directional Path in BGP-LS August 2019

Copyright Notice

Copyright (c) 2019 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.	Terminology	3
3.	Carrying SR Path Sub-TLVs in BGP-LS	3
3.1.	SR Path Segment Sub-TLV	5
3.2.	Sub-TLVs for Bidirectional Path	6
3.2.1.	SR Bidirectional Path Sub-TLV	6
3.2.2.	SR Reverse Path Segment List Sub-TLV	7
4.	Operations	7
5.	IANA Considerations	7
5.1.	BGP-LS TLVs	7
5.2.	BGP-LS SR Segment Descriptors	8
6.	Security Considerations	8
7.	Acknowledgements	8
8.	References	8
8.1.	Normative References	8
8.2.	Informative References	9
	Authors' Addresses	10

[1.](#) Introduction

Segment routing (SR) [[RFC8402](#)] is a source routing paradigm that allows the ingress node steers packets into a specific path according to the Segment Routing Policy [[I-D.ietf-spring-segment-routing-policy](#)].

However, the SR Policies defined in

[\[I-D.ietf-spring-segment-routing-policy\]](#) only supports unidirectional SR paths and there is no path ID in a Segment List to identify an SR path. For identifying an SR path and supporting bidirectional path [\[I-D.ietf-spring-mpls-path-segment\]](#), new policies carrying Path Segment and bidirectional path information are defined in

[\[I-D.li-idr-sr-policy-path-segment-distribution\]](#), as well as the extensions to BGP to distribute new SR policies. The Path Segment can be a Path Segment in SR-MPLS [\[I-D.ietf-spring-mpls-path-segment\]](#), or other IDs that can identify a path.

In many network scenarios, the configuration and state of each TE Policy is required by a controller which allows the network operator to optimize several functions and operations through the use of a controller aware of both topology and state information [\[I-D.ietf-idr-te-lsp-distribution\]](#).

To collect the TE Policy information that is locally available in a router, [\[I-D.ietf-idr-te-lsp-distribution\]](#) describes a new mechanism by using BGP-LS update messages.

Based on the mechanism defined in [\[I-D.ietf-idr-te-lsp-distribution\]](#), this document describes a mechanism to distribute configuration and states of the new SR policies defined in [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#) to external components using BGP-LS.

2. Terminology

This memo makes use of the terms defined in [\[RFC8402\]](#) and [\[I-D.ietf-idr-te-lsp-distribution\]](#).

3. Carrying SR Path Sub-TLVs in BGP-LS

A mechanism to collect states of SR Policies via BGP-LS is proposed by [\[I-D.ietf-idr-te-lsp-distribution\]](#). The characteristics of an SR policy can be described by a TE Policy State TLV, which is carried in the optional non-transitive BGP Attribute "LINK_STATE Attribute" defined in [\[RFC7752\]](#). The TE Policy State TLV contains several sub-TLVs such as SR TE Policy sub-TLVs. Rather than replicating SR TE Policy sub-TLVs, [\[I-D.ietf-idr-te-lsp-distribution\]](#) reuses the equivalent sub-TLVs as defined in

[\[I-D.ietf-idr-segment-routing-te-policy\]](#).

[I-D.li-idr-sr-policy-path-segment-distribution] defines the BGP extensions for Path Segment. The Path Segment can appear at both segment-list level and candidate path level upon the use case. The encoding is shown below.

Li, et al.

Expires February 9, 2020

[Page 3]

Internet-Draft Path ID and Bi-directional Path in BGP-LS August 2019

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)

 Path Segment

 Segment List

 Weight

 Path Segment

 Segment

 Segment

 ...

 Segment List

 Weight

 Path Segment

 Segment

 Segment

 ...

 ...

Figure 1. Path Segment in SR policy

Also, [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#) defines SR policy extensions for bidirectional SR path, the encoding is shown 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)

Bidirectional Path

Segment List

Weight

Path Segment

Segment

Segment

...

Reverse Segment List

Weight

Path Segment

Segment

Segment

...

Figure 2. SR policy for Bidirectional path

In order to collect configuration and states of unidirectional and bidirectional SR policies defined in [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#), new sub-TLVs in SR TE Policy sub-TLVs should be defined. Likewise, rather than replicating SR Policy sub-TLVs, this document can reuse the equivalent sub-TLVs as defined in [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#).

3.1. SR Path Segment Sub-TLV

This section reuses the SR Path Segment sub-TLV defined in [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#) to describe a Path Segment, and it can be included in the Segment List sub-TLV as defined in [\[I-D.ietf-idr-te-lsp-distribution\]](#). An SR Path Segment sub-TLV can be associated with an SR path specified by a Segment List sub-TLV, and it MUST appear only once within a Segment List sub-TLV. Also, it can be used for identifying an SR candidate path or an SR Policy defined in [\[I-D.ietf-spring-segment-routing-policy\]](#).

The format of Path Segment TLV is included below for reference.

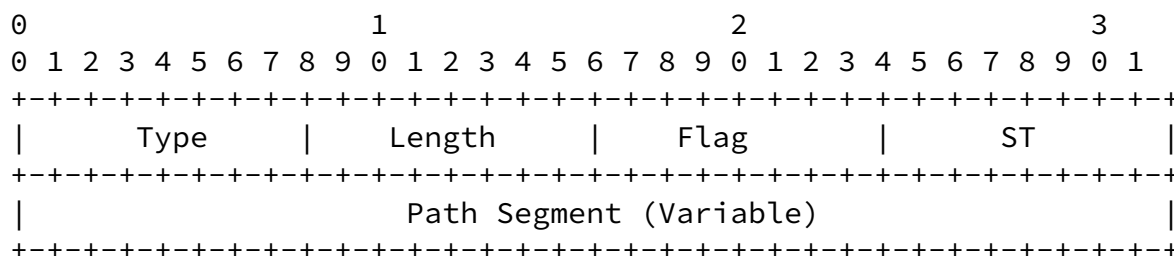


Figure 2. Path Segment sub-TLV

All fields, including type and length, are defined in [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#).

3.2. Sub-TLVs for Bidirectional Path

In some scenarios like mobile backhaul transport network, there are

requirements to support bidirectional path. In SR, a bidirectional path can be represented as a binding of two unidirectional SR paths [[I-D.ietf-spring-mpls-path-segment](#)].

[[I-D.li-idr-sr-policy-path-segment-distribution](#)] defines new sub-TLVs to describe an SR bidirectional path. An SR policy carrying SR bidirectional path information is expressed in Figure 1.

3.2.1. SR Bidirectional Path Sub-TLV

This section reuses the SR bidirectional path sub-TLV defined in [[I-D.li-idr-sr-policy-path-segment-distribution](#)] to specify a bidirectional path, which contains a Segment List sub-TLV [[I-D.ietf-idr-segment-routing-te-policy](#)] and an associated Reverse Path Segment List as defined in [[I-D.li-idr-sr-policy-path-segment-distribution](#)]. The SR bidirectional path sub-TLV has the following format:

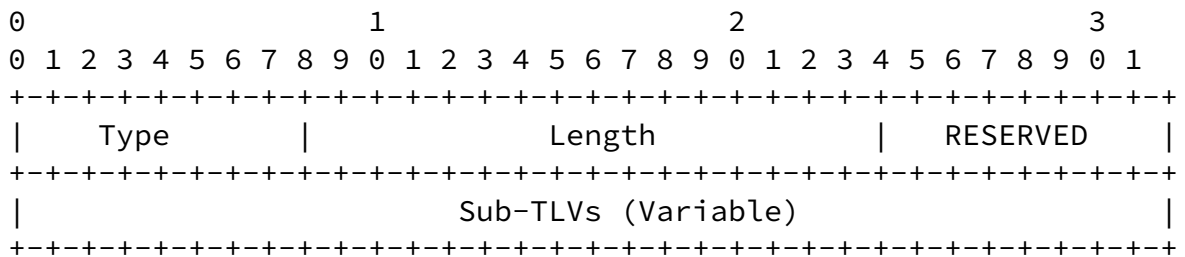


Figure 3. SR Bidirectional path sub-TLV

All fields, including type and length, are defined in [[I-D.li-idr-sr-policy-path-segment-distribution](#)].

3.2.2. SR Reverse Path Segment List Sub-TLV

This section reuses the SR Reverse Path Segment List sub-TLV defined in [[I-D.li-idr-sr-policy-path-segment-distribution](#)] to specify an reverse SR path associated with the path specified by the Segment List in the same SR Bidirectional Path Sub-TLV, and it has the following format:

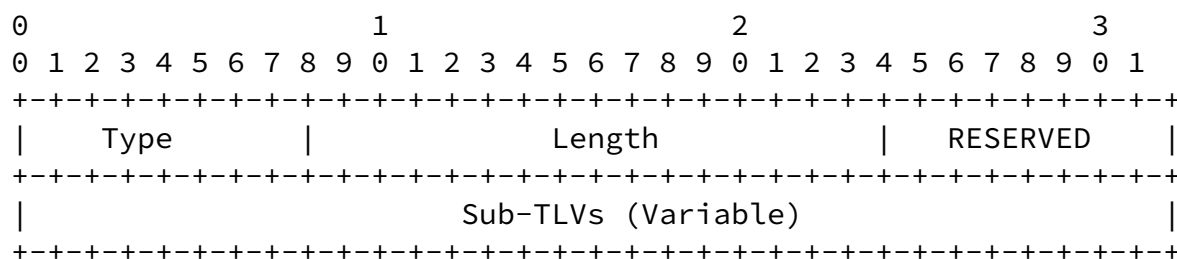


Figure 4. SR Reverse Path Segment List Sub-TLV

All fields, including type and length, are defined in [\[I-D.li-idr-sr-policy-path-segment-distribution\]](#).

4. Operations

No new operation procedures are defined in this document, the operations procedures of [\[RFC7752\]](#) can apply to this document.

Typically but not limited to, the uni/bidirectional SR policies carrying path identification information can be distributed by the ingress node.

Generally, BGP-LS is used for collecting link states and synchronizing with the external component. The consumer of the uni/bidirectional SR policies carrying path identification information is not BGP LS process by itself, and it can be any applications such as performance measurement [\[I-D.gandhi-spring-udp-pm\]](#) and path re-computation or re-optimization, etc. The operation of sending information to other precesses is out of scope of this document.

5. IANA Considerations

5.1. BGP-LS TLVs

IANA maintains a registry called "Border Gateway Protocol - Link State (BGP-LS) Parameters" with a sub-registry called "Node Anchor, Link Descriptor and Link Attribute TLVs". The following TLV codepoints are suggested (for early allocation by IANA):

Codepoint	Description	Reference
1212	Path Segment sub-TLV	This document
1213	SR Bidirectional Path sub-TLV	This document
1214	Reverse Segment List sub-TLV	This document

5.2. BGP-LS SR Segment Descriptors

This document defines new sub-TLVs in the registry "SR Segment Descriptor Types" [[I-D.ietf-idr-te-lsp-distribution](#)] to be assigned by IANA:

Codepoint	Description	Reference
14	Path Segment sub-TLV	This document

6. Security Considerations

TBA

7. Acknowledgements

Many thanks to Shraddha Hedge for her detailed review and professional comments.

8. References

8.1. Normative References

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

Previdi, S., Filshil, C., Mattes, P., Rosen, E., Jain, D., and S. Lin, "Advertising Segment Routing Policies in BGP", [draft-ietf-idr-segment-routing-te-policy-07](#) (work in progress), July 2019.

[I-D.ietf-idr-te-lsp-distribution]

Previdi, S., Talaulikar, K., Dong, J., Chen, M., Gredler, H., and J. Tantsura, "Distribution of Traffic Engineering (TE) Policies and State using BGP-LS", [draft-ietf-idr-te-lsp-distribution-11](#) (work in progress), May 2019.

[I-D.ietf-spring-mpls-path-segment]

Cheng, W., Li, H., Chen, M., Gandhi, R., and R. Zigler, "Path Segment in MPLS Based Segment Routing Network", [draft-ietf-spring-mpls-path-segment-00](#) (work in progress), March 2019.

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

Filsfils, C., Sivabalan, S., daniel.voyer@bell.ca, d., bogdanov@google.com, b., and P. Mattes, "Segment Routing Policy Architecture", [draft-ietf-spring-segment-routing-policy-03](#) (work in progress), May 2019.

[I-D.li-idr-sr-policy-path-segment-distribution]

Li, C., Chen, M., Dong, J., and Z. Li, "Segment Routing Policies for Path Segment and Bidirectional Path", [draft-li-idr-sr-policy-path-segment-distribution-01](#) (work in progress), October 2018.

[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>>.

[RFC7752] Gredler, H., Ed., Medved, J., Previdi, S., Farrel, A., and S. Ray, "North-Bound Distribution of Link-State and Traffic Engineering (TE) Information Using BGP", [RFC 7752](#), DOI 10.17487/RFC7752, March 2016, <<https://www.rfc-editor.org/info/rfc7752>>.

[RFC8402] Filsfils, C., Ed., Previdi, S., Ed., Ginsberg, L., Decraene, B., Litkowski, S., and R. Shakir, "Segment Routing Architecture", [RFC 8402](#), DOI 10.17487/RFC8402, July 2018, <<https://www.rfc-editor.org/info/rfc8402>>.

[8.2.](#) Informative References

[I-D.gandhi-spring-udp-pm]

Gandhi, R., Filsfils, C., daniel.voyer@bell.ca, d., Salsano, S., Ventre, P., and M. Chen, "UDP Path for In-band Performance Measurement for Segment Routing Networks", [draft-gandhi-spring-udp-pm-02](#) (work in progress), September 2018.

[I-D.ietf-mpls-bfd-directed]

Mirsky, G., Tantsura, J., Varlashkin, I., and M. Chen, "Bidirectional Forwarding Detection (BFD) Directed Return

Path", [draft-ietf-mpls-bfd-directed-11](#) (work in progress),
April 2019.

Li, et al.

Expires February 9, 2020

[Page 9]

Internet-Draft Path ID and Bi-directional Path in BGP-LS August 2019

Authors' Addresses

Cheng Li
Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing 100095
China

Email: chengli13@huawei.com

Huanan Chen
China Telecom
109 West Zhongshan Ave
Guangzhou
China

Email: chenhn8.gd@chinatelecom.cn

Mach(Guoyi) Chen
Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing 100095
China

Email: Mach.chen@huawei.com

Jie Dong
Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing 100095
China

Email: jie.dong@huawei.com

Zhenbin Li

Huawei Technologies
Huawei Campus, No. 156 Beiqing Rd.
Beijing 100095
China

Email: lizhenbin@huawei.com

Li, et al.

Expires February 9, 2020

[Page 10]