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SR Policies Extensions for Path Segment and Bidirectional Path in BGP-LS

draft-ietf-idr-bgp-ls-sr-policy-path-segment-01

Abstract

This document specifies the way of collecting configuration and states of SR policies carrying Path Segment and bidirectional path information by using BPG-LS. Such information can be used by external conponents 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.

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This Internet-Draft will expire on January 9, 2022.

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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.

```
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)
        Bidirectioanl 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.

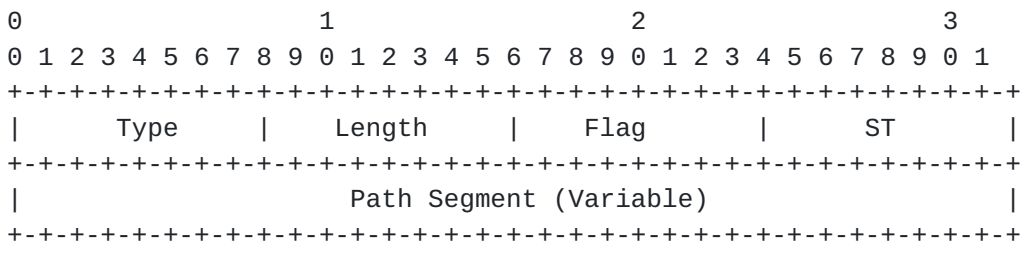

Figure 2. Path Segment sub-TLV

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:

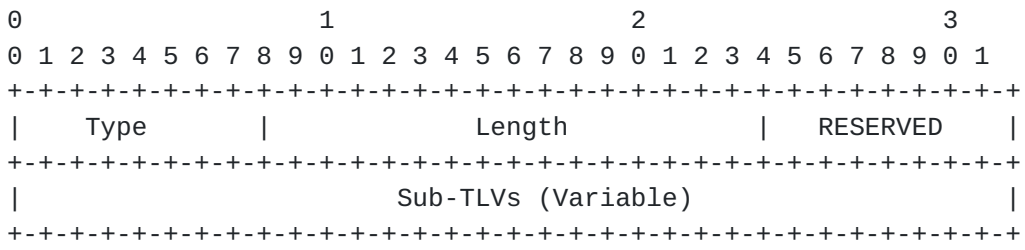

Figure 3. SR Bidirectional path sub-TLV

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:

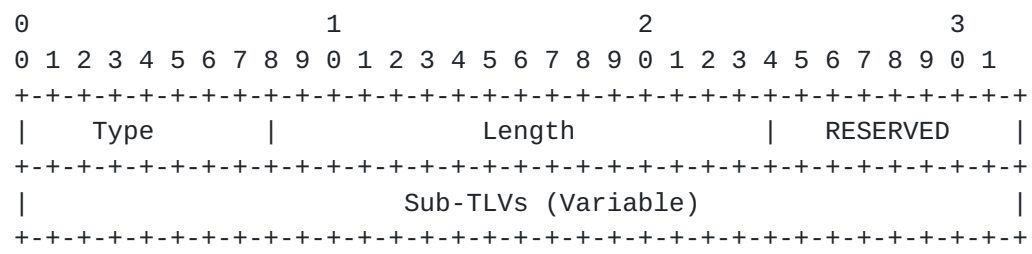

Figure 4. SR Reverse Path Segment List Sub-TLV

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-coputation 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

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8. Acknowledgements

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9.2. Informative References

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