SR Policies for Path Segment and Bidirectional Path in BGP-LS
draft-li-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 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

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1. Introduction

Segment routing (SR) [RFC8402] is a source routing paradigm that allows the ingress node to steer 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 support 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.cheng-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.cheng-spring-mpls-path-segment], or a Path Segment in SRv6 [I-D.li-spring-srv6-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].

As defined in [I-D.li-idr-sr-policy-path-segment-distribution], the new SR policies for bidirectional path has the following format:
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 1. SR policy for Bidirectional path

For collecting 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.
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.cheng-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:

```
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Type | Length | RESERVED |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
| Sub-TLVs (Variable) |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

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 a 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:

```plaintext
+---------------+-------------------+-------------------+
<table>
<thead>
<tr>
<th>Type</th>
<th>Length</th>
<th>RESERVED</th>
</tr>
</thead>
</table>
+---------------+-------------------+-------------------+
|                        Sub-TLVs (Variable) |
+---------------+-------------------+-------------------+
```

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 operation 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 recalculation or re-optimization, etc. The operation of sending information to other processes is out of scope of this document.

5. IANA Considerations

TBA

6. Security Considerations

TBA
7. Acknowledgements

TBA

8. References

8.1. Normative References

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

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

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

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

[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 Bi-directional Path", draft-li-idr-sr-policy-path-segment-distribution-00 (work in progress), April 2018.

[I-D.li-spring-srv6-path-segment]

8.2. Informative References


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