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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 [[RFC9256](#)].

However, the SR Policies defined in [[RFC9256](#)] 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.ietf-idr-sr-policy-path-segment](#)], 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](#)] and SRv6 [[I-D.ietf-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.ietf-idr-sr-policy-path-segment](#)] 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.

[[I-D.ietf-idr-sr-policy-path-segment](#)] defines the BGP extensions for Path Segment. 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)

 Segment List

 Weight

 Path Segment

 Segment

 Segment

 ...

 Segment List

 Weight

 Path Segment

 Segment

 Segment

 ...

 ...

Figure 1. Path Segment in SR policy

Also, [[I-D.ietf-idr-sr-policy-path-segment](#)] 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)
    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 [\[I-D.ietf-idr-sr-policy-path-segment\]](#), this document defines new sub-TLVs in SR TE Policy sub-TLVs.

3.1. SR Path Segment Sub-TLV

This section defines the SR Path Segment sub-TLV 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. Multiple Path Segment MAY be included in a Segment List for different use cases. When all the SID Lists within a candidate path share the same Path Segment ID, the Path Segment can be used to collect the aggregated information of the candidate path. The format of Path Segment TLV is shown below.

The SRv6 Endpoint Behavior TLV (1250) and the SRv6 SID Structure TLV (1252) defined in [[I-D.ietf-idr-bgpls-srv6-ext](#)] are used as sub-TLVs of the SR Path Segment Sub-TLV to optionally indicate the SRv6 Endpoint behavior and SID structure for the Binding SID value in the TLV when the Path Segment is an SRv6 Path Segment.

3.2. Reverse Segment List Sub-TLV

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](#)]. An SR policy carrying SR bidirectional path information is expressed in Figure 2. [[I-D.ietf-idr-sr-policy-path-segment](#)] defines a new sub-TLV to describe a reversed SR path of an SID list.

This section defines a Reverse Segment List sub-TLV to specify a reverse SR path associated with the path specified by the Segment List, and it reuses the format of SR Segment List TLV defined in [[I-D.ietf-idr-te-lsp-distribution](#)]:

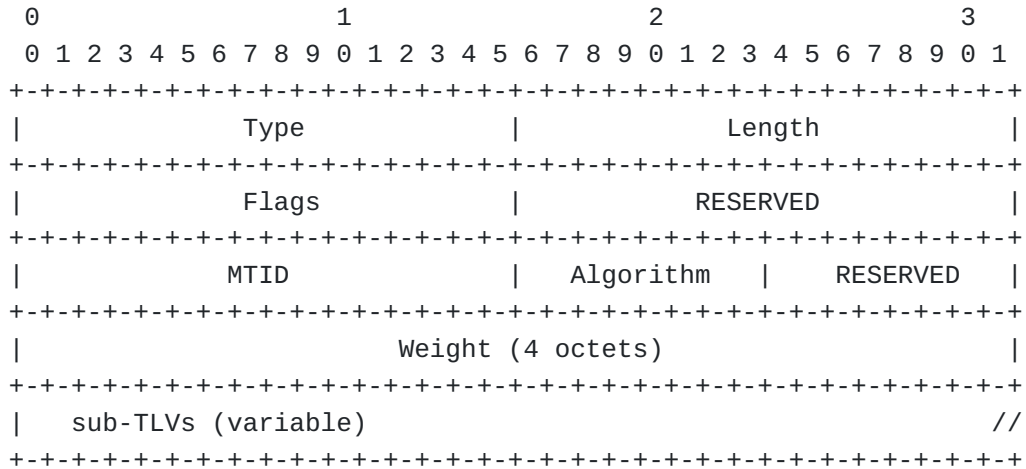


Figure 5. Reverse Segment List Sub-TLV

All fields, except the type are defined in [[I-D.ietf-idr-te-lsp-distribution](#)], and this TLV reuses it directly. The Type of this TLV is TBA.

The SR Segment sub-TLV [[I-D.ietf-idr-te-lsp-distribution](#)] MUST be included as an ordered set of sub-TLVs within the SR Segment List TLV when the SID-List is not empty. A SID-List may be empty in certain cases (e.g. for a dynamic path) where the headend has not yet performed the computation and hence not derived the segments required for the path; in such cases, the SR Segment List TLV SHOULD NOT include any SR Segment sub-TLVs [[I-D.ietf-idr-te-lsp-distribution](#)].

Note: currently, only one reverse SID list is supported, so the weight field CAN be ignored when processing. However, multiple reverse SID list MAY be supported in the future, and the use case of supporting this still need to be discussed.

4. Operations

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

TBA	Path Segment sub-TLV	This document
TBA	Reverse Segment List sub-TLV	This document

6. Security Considerations

TBA

7. Contributors

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

James N Guichard
Futurewei Technologies
2330 Central Express Way
Santa Clara
USA

Email: james.n.guichard@futurewei.com

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Authors' Addresses

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

Email: c.l@huawei.com

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

Email: lizhenbin@huawei.com

Yongqing Zhu
China Telecom
109 West Zhongshan Ave
Guangzhou
China

Email: zhuyq8@chinatelecom.cn

Weiqiang Cheng
China Mobile
Beijing
China

Email: chengweiqiang@chinamobile.com

Ketan Talaulikar
Cisco Systems

Email: ketant.ietf@gmail.com