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C. Li
M. Chen
J. Dong
Z. Li
Huawei Technologies
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Segment Routing Policies for Path Segment and Bidirectional Path
draft-li-idr-sr-policy-path-segment-distribution-01

Abstract

An SR policy is a set of candidate SR paths consisting of one or more segment lists with necessary path attributes. For each SR path, it may also have its own path attributes, and Path Segment is one of them. A Path Segment is defined to identify an SR path, which can be used for performance measurement, path correlation, and end-2-end path protection. Path Segment can be also used to correlate two unidirctional SR paths into a bidirectional SR path which is required in some scenarios, for example, mobile backhaul transport network.

This document defines extensions to BGP to distribute SR policies carrying Path Segment and bidirectional path information.

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].

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1. Introduction

Segment routing (SR) [RFC8402] is a source routing paradigm that explicitly indicates the forwarding path for packets at the ingress node. The ingress node steers packets into a specific path according to the Segment Routing Policy (SR Policy) as defined in [I-D.ietf-spring-segment-routing-policy]. For distributing SR policies to the headend, [I-D.ietf-idr-segment-routing-te-policy] specifies a mechanism by using BGP, and new sub-TLVs are defined for SR Policies in BGP UPDATE message.

In many use cases such as performance measurement, the path to which the packets belong is required to be identified. Futhermore, in some scenarios, for example, mobile backhaul transport network, there are requirements to support bidirectional path. However, there is no

path identification information for each Segment List in the SR Policies defined in [I-D.ietf-spring-segment-routing-policy]. Also, the SR Policies defined in [I-D.ietf-spring-segment-routing-policy] only supports unidirectional SR paths.

Therefore, this document defines the extension to SR policies that carry Path Segment in the Segment List and support bidirectional path. 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. Also, this document defines extensions to BGP to distribute SR policies carriying Path Segment and bidirectional path information.

2. Terminology

This memo makes use of the terms defined in [RFC8402] and [I-D.ietf-idr-segment-routing-te-policy].

3. SR Policy for Path Identifier

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
              ...
          ...
```

An SR path can be specified by an Segment List sub-TLV that contains a set of segment sub-TLVs and other sub-TLVs as shown above. As defined in [I-D.ietf-spring-segment-routing-policy], a candidate path includes multiple SR paths specified by SID list. The Path Segment can be used for idendifying an SR path(specified by SID list). Also, it can be used for identifying an SR candidate path or an SR Policy in some use cases if needed. 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)
          Path Segment
          Segment List
              Weight
              Path Segment
              Segment
              Segment
              ...
          Segment List
              Weight
              Path Segment
              Segment
              Segment
              ...
          ...
```

3.1. SR Path Segment Sub-TLV

This section defines an SR Path Segment sub-TLV.

An SR Path Segment sub-TLV can be included in the segment list sub-TLV to identify an SID list, and it MUST appear only once within a Segment List sub-TLV. It has the following format:

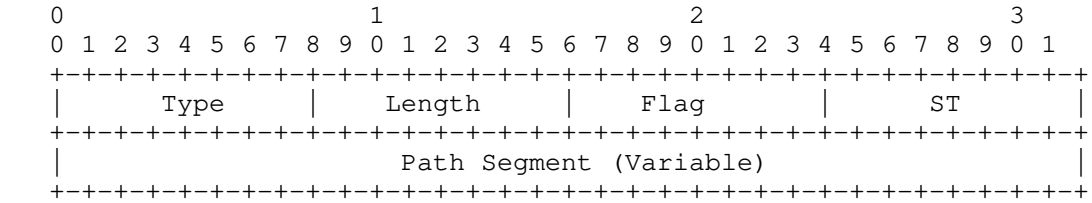


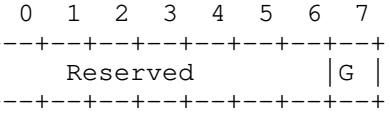
Figure 1. Path Segment sub-TLV

Where:

Type: to be assigned by IANA (suggested value 10).

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

Flag: 8 bits of flags. Following flags are defined:



G-Flag: Global flag. Set when the Path Segment is global within an SR domain.

Reserved: 5 bits reserved and MUST be set to 0 on transmission and MUST be ignored on receipt.

ST: Segment type, specifies the type of the Path Segment, and it has following types:

- 0: SR-MPLS Path Segment
- 1: SRv6 Path Segment
- 2-255:Reserved

Path Segment: The Path Segment of an SR path. The Path Segment type is indicated by the Segment Type(ST) field. It 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.

4. SR Policy for Bidirectional Path

In some scenarios, for example, 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. This document also defines new sub-TLVs to describe an SR bidirectional path. An SR policy carrying SR bidirectional path information 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)
        Bidirectioanl Path
            Segment List
                Weight
                Path Segment
                Segment
                Segment
                ...
            Reverse Segment List
                Weight
                Path Segment
                Segment
                Segment
                ...
```

4.1. SR Bidirectional Path Sub-TLV

This section defines an SR bidirectional path sub-TLV 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 at section 4.2. The SR bidirectional path sub-TLV has the following format:

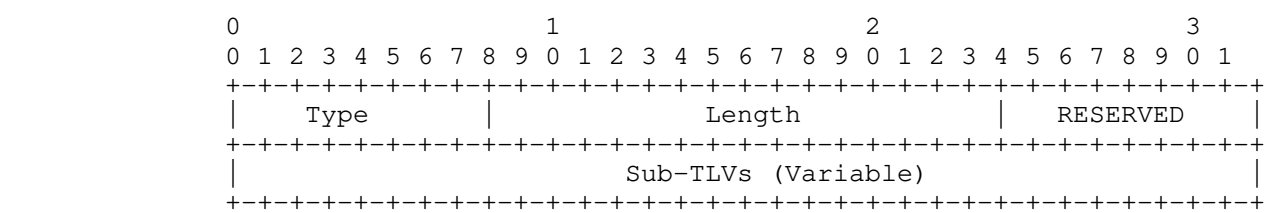


Figure 2. SR Bidirectional path sub-TLV

Where:

Type: TBA, and the suggest value is 14.

Length: the total length of the sub-TLVs encoded within the SR Bidirectional Path Sub-TLV not including Type and Length fields.

RESERVED: 1 octet of reserved bits. SHOULD be unset on transmission and MUST be ignored on receipt.

Sub-TLVs:

- An Segment List sub-TLV
- An associated Reverse Path Segment List sub-TLV

4.2. SR Reverse Path Segment List Sub-TLV

An SR Reverse Path Segment List sub-TLV is defined to specify an SR reverse path associated with the path specified by the Segment List in the same SR Bidirectional Path Sub-TLV, and it has the following format:

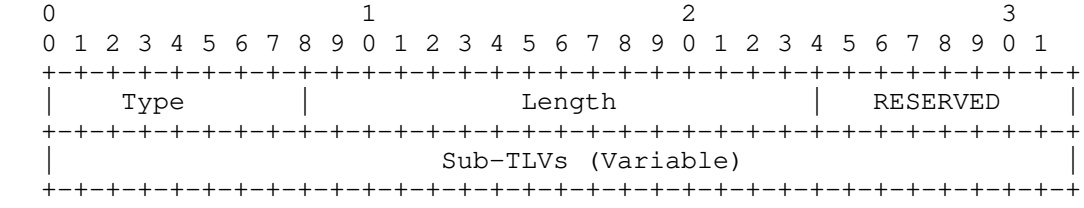


Figure 2. SR Reverse Path Segment List Sub-TLV

where:

Type: TBA, and suggest value is 127.

Length: the total length of the sub-TLVs encoded within the SR Reverse Path Segment List Sub-TLV not including the Type and Length fields.

RESERVED: 1 octet of reserved bits. SHOULD be unset on transmission and MUST be ignored on receipt.

sub-TLVs, reuse the sub-TLVs in Segment List defined in [I-D.ietf-idr-segment-routing-te-policy].

- An optional single Weight sub-TLV.
- An mandatory SR Path Segment sub-TLV that contains the Path Segment of the reverse SR path.
- Zero or more Segment sub-TLVs to specify the reverse SR path.

The Segment sub-TLVs in the Reverse Path Segment List sub-TLV provides the information of the reverse SR path, which can be used

for directing egress BFD peer to use specific path for the reverse direction of the BFD session [I-D.ietf-mpls-bfd-directed] or other applications.

5. Operations

The document does not bring new operation beyong the description of operations defined in [I-D.ietf-idr-segment-routing-te-policy]. The existing operations defined in [I-D.ietf-idr-segment-routing-te-policy] can apply to this document directly.

Typically but not limit to, the unidirectional or bidirectional SR policies carrying path identification infomation are configured by a controller.

After configuration, the unidirectional or bidirectional SR policies carrying path identification infomation will be advertised by BGP update messages. The operation of advertisement is the same as defined in [I-D.ietf-idr-segment-routing-te-policy], as well as the receiption.

The consumer of the unidirectional or bidirectional SR policies is not the BGP process, it can be any applications, such as performance measurement [I-D.gandhi-spring-udp-pm]. The operation of sending information to consumers is out of scope of this document.

6. IANA Considerations

TBA

7. Security Considerations

TBA

8. Acknowledgements

TBA

9. References

9.1. Normative References

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Authors' Addresses

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

Email: chengli13@huawei.com

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