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Segment Routing Policies for Path Segment and Bi-directional Path draft-li-idr-sr-policy-path-segment-distribution-00

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 bi-directional SR path which is required in some scenarios, for example, mobile backhaul transport network.

This document defines extensions to BGP to distribute SR policies carriying Path segment and bi-directional 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].

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 October 5, 2018.

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1. Introduction

Segment routing (SR) [I-D.ietf-spring-segment-routing] 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.filsfils-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 bi-directional path. However, there is no path ID for each Segment List in the SR Policies defined in [I-D.filsfils-spring-segment-routing-policy]. Also, the SR Policies defined in [I-D.filsfils-spring-segment-routing-policy] only supports uni-directional SR paths.

Therefore, this document defines the extension to SR policies that carry path ID information in the Segment List and support bi-directional path. The path ID can be a path segment in SR-MPLS [I-D.cheng-spring-mpls-path-segment] , or a path ID in SRv6 [I-D.li-spring-passive-pm-for-srv6-np], or other IDs that can identify a path. Also, this document defines extensions to BGP to distribute SR policies carriying Path segment and bi-directional path information.

2. Terminology

This memo makes use of the terms defined in [I-D.ietf-spring-segment-routing] and [I-D.ietf-idr-segment-routing-te-policy]. It also introduces the following terminologies.

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
        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 introduced in Section 1, each SR path may have a dedicated path identifier, an SR policy carrying a SR path identifier is expressed as below:

```
SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
    Attributes: Tunnel Encaps Attribute (23)
    Tunnel Type: SR Policy
        Binding SID
        Preference
        Segment List
            Weight
            Path ID
            Segment
            Segment
            ...
```

3.1. SR Path ID Sub-TLV

This section defines an SR Path ID sub-TLV to specify an SR path, and it is included in the segment list sub-TLV.

An SR Path ID sub-TLV is associated with an SR path specified by a segment list sub-TLV, and it MUST appear only once within a Segment List sub-TLV. It has the following format:

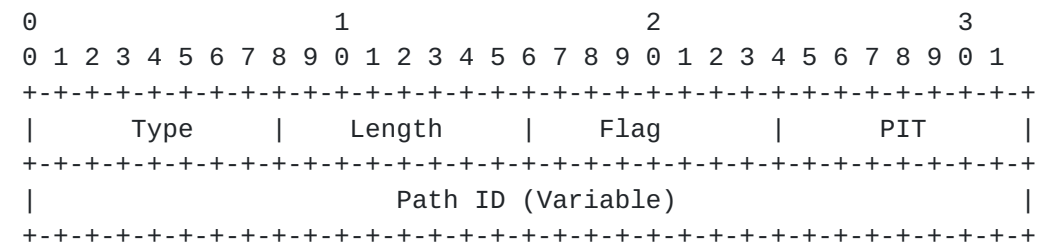


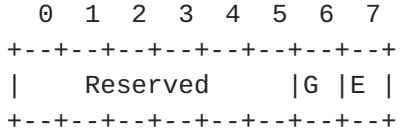
Figure 1. Path ID sub-TLV

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/ID is global within an SR domain.

E-Flag: Egress flag for local sgement/ID. The E-flag should be set when a path segment/ID is a local segment/ID allocated by the egress node. Else, the path segment/ID is a local segment/ID allocated by the ingress node. When the Path segment/ID is global within an SR domain(G-flag is set), this flag should be ignored.

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

PIT: Path ID type, specifies the type of the Path ID, and it has following types:

- 0: SR-MPLS Path Label
- 1: 4-octets integer Path ID
- 2: SRv6 SID
- 3-255:Reserved

Path ID: The Path ID of an SR path. The Path ID type is indicated by the Path ID Type(PIT) field. It can be a path segment [I-D.cheng-spring-mpls-path-segment], or it can be a 4 octets integer ID as defined in [I-D.li-spring-passive-pm-for-srv6-np], or other IDs that can identify a path.

When the type of Path ID is 0, and the E-flag and the G-flag are unset, meaning the Path ID is a local path label allocated by the ingress node in SR-MPLS, a path can be identified by a combination of this path ID and a non-routable Source label, as defined at section 2.2 in [I-D.cheng-spring-mpls-path-segment]. The non-routable Source Label, as known as a non-routable source node ID, can be configured by many ways like CLI, and it is out of scope of this document and will be discussed in other documents.

4. SR Policy for Bi-directional Path

In some scenarios, for example, mobile backhaul transport network, there are requirements to support bi-directional path. In SR, a bi-directional path can be represented as a binding of two uni-directional SR paths. This document also defines new sub-TLVs to describe an SR bi-directional path. An SR policy carrying SR bi-directional 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
        Bi-directioanl Path
            Segment List
                Weight
                Path ID
                Segment
                Segment
                ...
            Reverse Segment List
                Weight
                Path ID
                Segment
                Segment
                ...
```

4.1. SR Bi-directional Path Sub-TLV

This section defines an SR bi-directional path sub-TLV to specify a bi-directional 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 bi-directional path sub-TLV has the following format:

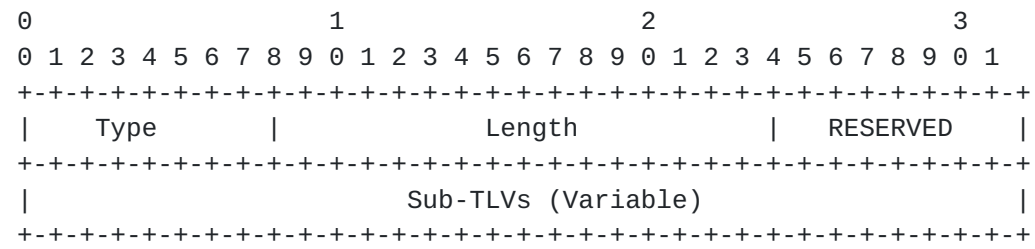


Figure 2. SR Bi-directional path sub-TLV

Where:

Type: TBA, and the suggest value is 14.

Length: the total length of the sub-TLVs encoded within the SR Bi-directional 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 Bi-directional Path Sub-TLV, and it has the following format:

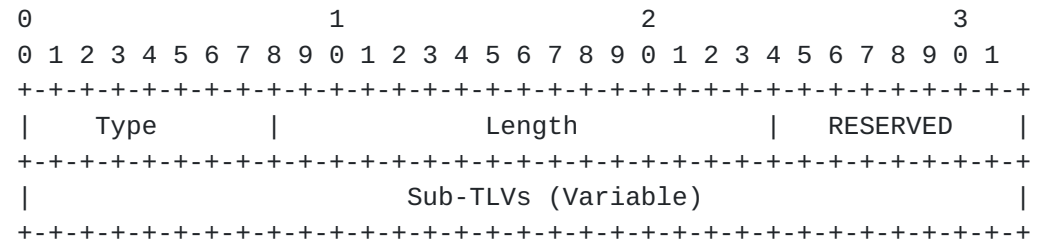


Figure 2. SR Reverse Path Segment List Sub-TLV

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:

- An optional single Weight sub-TLV.

- An mandatory SR Path ID sub-TLV that contains the path ID 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 uni-directional or bi-directional SR policies carrying path identification infomation are configured by a controller.

After configuration, the uni-directional or bi-directional 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 uni-directional or bi-directional SR policies is not the BGP process, it can be any applications, such as performance measurement. 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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