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Internet Draft   New H3C Technologies
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                                                    December 12, 2022

BGP Extensions of SR Policy for Headend Behavior
draft-lin-idr-sr-policy-headend-behavior-01

Abstract

   This document defines extensions to Border Gateway Protocol (BGP) to
   distribute SR policies carrying headend behavior.

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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 [RFC9256].
In order to distribute SR policies to the headend, [I-D.ietf-idr-
segment-routing-te-policy] specifies a mechanism by using BGP.

As described in [RFC9256], a headend can steer a packet flow into an
SR Policy in various ways, including BSID steering, per-destination
steering, per-flow steering, and policy-based steering. Moreover,
[I-D.jiang-idr-ts-flowspec-srv6-policy] describes a way by using BGP
FlowSpec to steer packets into an SRv6 Policy.

[RFC8986] defines End.B6.Encaps behavior and End.B6.Encaps.Red
behavior for SRv6 BSID. [I-D.filsfils-spring-srv6-net-pgm-insertion]
extends the SRv6 BSID behaviors with End.B6.Insert and
End.B6.Insert.Red. When receiving packets with an active SID
matching a local BSID of these kinds, the headend will perform
corresponding behaviors. Different BSID behaviors are suitable for
different scenarios. For example, comparing with End.B6.Encaps,
End.B6.Encaps.Red reduces the size of the SRH by excluding the first
SID, which can be useful for the devices with lower capacity of SID
depths, like the switches in data center network. End.B6.Insert
inserts a new SRH in between the IPv6 Header and the received SRH
rather than pushing a new IPv6 header, which can be applied to

express scalable traffic-engineering policies across multiple
domains.

The SRv6 Binding SID sub-TLV is defined in [I-D.ietf-idr-segment-
routing-te-policy] to signal the SRv6 BSID information along with SR
Policies. It enables the specified SRv6 BSID behavior to be
instantiated on the headend node. However, if the packets are
steering into an SR Policy in some other way than using BSID, the
headend behavior is not specified during the distributing of SR
Policy by BGP. The network operator has to use additional tools,
like NETCONF, to signal the headend behavior.

This document defines extensions to Border Gateway Protocol (BGP) to
distribute SR policies carrying headend behavior. So that the
headend can be instructed to perform specific behavior when packets
are steered into the SR policy without BSID.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
"SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and
"OPTIONAL" in this document are to be interpreted as described in
BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all
capitals, as shown here.

2. Headend Behavior in SR Policy

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
        SRv6 Binding SID
        Preference
        Priority
        Policy Name
        Policy Candidate Path Name
        Explicit NULL Label Policy (ENLP)
        Segment List
           Weight
          Segment
          Segment
          ...
        ...
```

SR policy with headend behavior is expressed as follows:

```
SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
  Attributes:
    Tunnel Encaps Attribute (23)
      Tunnel Type: SR Policy
        Binding SID
        SRv6 Binding SID
        Preference
        Priority
        Policy Name
        Policy Candidate Path Name
        Explicit NULL Label Policy (ENLP)
        Headend Behavior
        L2 Headend Behavior
        Segment List
           Weight
          Segment
          Segment
          ...
        ...
```

2.1. Headend Behavior Sub-TLV

The Headend Behavior sub-TLV encodes the default headend behavior
associated with the candidate path for L3 traffic. When the headend
steers L3 packets into that SR Policy and the associated candidate
path is active, the specific headend behavior should be performed by
default. In the case of BSID steering, the behavior defined by the
BSID overrides the default headend behavior.

The Headend Behavior sub-TLV is optional, and MUST NOT appear more
than once in the SR Policy encoding.

The Headend Behavior sub-TLV has the following format:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 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          |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|        Headend Behavior       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```
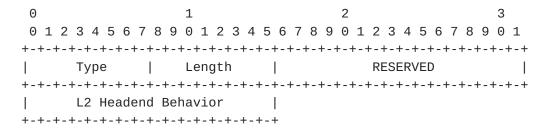
where:

o Type: to be assigned by IANA.

o Length: 4.

o RESERVED: 2 octets of reserved bits. SHOULD be set to zero on
   transmission and MUST be ignored on receipt.

o Headend Behavior: a 2-octet value. The following values are
   defined.

   * TBD: H.Encaps. A headend behavior defined in [RFC8986].

   * TBD: H.Encaps.Red. A headend behavior defined in [RFC8986].

   * TBD: H.Insert. A headend behavior defined in [I-D.filsfils-
        spring-srv6-net-pgm-insertion].

   * TBD: H.Insert.Red. A headend behavior defined in [I-
        D.filsfils-spring-srv6-net-pgm-insertion].

2.2. L2 Headend Behavior Sub-TLV

The L2 Headend Behavior sub-TLV encodes the default headend behavior
associated with the candidate path for L2 traffic. When the headend
steers L2 packets into that SR Policy and the associated candidate
path is active, the specific headend behavior should be performed by
default.

The L2 Headend Behavior sub-TLV is optional, and MUST NOT appear
more than once in the SR Policy encoding.

The L2 Headend Behavior sub-TLV has the following format:

```
 0                   1                   2                   3
 0 1 2 3 4 5 6 7 8 9 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            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|     L2 Headend Behavior       |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

where:

o Type: to be assigned by IANA.

o Length: 4.

o RESERVED: 2 octets of reserved bits. SHOULD be set to zero on
   transmission and MUST be ignored on receipt.

o L2 Headend Behavior: a 2-octet value. The following values are
   defined.

   * TBD: H.Encaps.L2. A headend behavior defined in [RFC8986].

   * TBD: H.Encaps.L2.Red. A headend behavior defined in [RFC8986].

3. Extensions of BGP-LS

[I-D.ietf-idr-te-lsp-distribution] describes a mechanism to collect
the SR policy information that is locally available in a node and
advertise it into BGP-LS updates. Extensions of BGP-LS for headend
behavior of SR Policy will be included in the future version of this
draft.

4. Security Considerations

Procedures and protocol extensions defined in this document do not
affect the security considerations discussed in [I-D.ietf-idr-
segment-routing-te-policy].

5. IANA Considerations

Headend Behavior Sub-TLV (TBD)

L2 Headend Behavior Sub-TLV (TBD)

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