IDR Working Group
Internet Draft
Intended status: Standards Track
Expires: April 12, 2026

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October 10, 2025

BGP Extensions of SR Policy for Headend Behavior
draft-lin-idr-sr-policy-headend-behavior-05

Abstract

RFC8986 defines H. Encaps behavior, H. Encaps.Red behavior, H. Encaps.L2 behavior, and H. Encaps.L2.Red behavior for SR policy. This document defines extensions to Border Gateway Protocol (BGP) to distribute SR policies carrying headend behavior.

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 April 12, 2026.

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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, [RFC9830] 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.ietf-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. 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.

The SRv6 Binding SID sub-TLV is defined in [RFC9830] 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.

[RFC8986] defines H. Encaps behavior, H. Encaps.Red behavior, H. Encaps.L2 behavior, and H. Encaps.L2.Red behavior for SR policy. 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. Use Case

[RFC8986] defines describes a set of SRv6 Policy Headend [RFC8402] behaviors.

- H.Encaps: SR Headend with Encapsulation in an SR Policy
- H.Encaps.Red: H.Encaps with Reduced Encapsulation
- H.Encaps.L2: H.Encaps Applied to Received L2 Frames
- H.Encaps.L2.Red: H.Encaps.Red Applied to Received L2 Frames

When a source does not need to preserve the entire SID list within the Segment Routing Header (SRH), a reduced SRH may be utilized. This reduced SRH (see Section 4.1.1 of [RFC8754]) omits the first segment of the associated SR Policy, as it already appears in the Destination Address (DA) of the IPv6 header. Utilizing the NEXT-CSID method from [RFC9800] enables further reduction in SRH size, thereby improving compression efficiency. In cases where traceability is necessary, a complete SID list should be preserved, which can be achieved through the Encap mode. Additionally, by leveraging the NEXT-CSID and/or REPLACE-CSID flavors as specified in [RFC9800] to minimize packet header length, the reduced SRH can further enhance compression performance.

3. Headend Behavior in SR Policy

As defined in [RFC9830], 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:

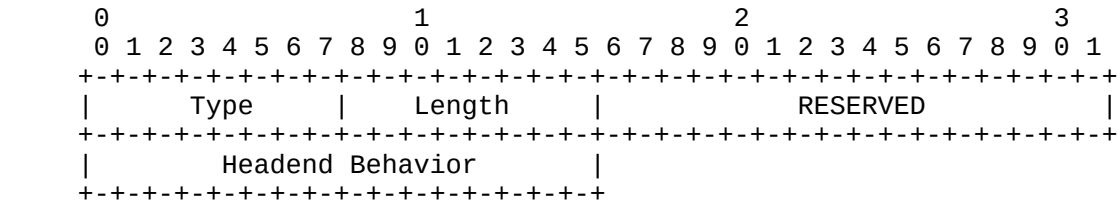
```
SR Policy SAFI NLRI: <Distinguisher, Policy-Color, Endpoint>
  Attributes:
    Tunnel Encaps Attribute (23)
      Tunnel Type: SR Policy
        Binding SID
        SRv6 Binding SID
        Preference
        Priority
        Policy Name
        Policy Candidate Path Name
        Explicit NULL Label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

3.1. 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:



where:

o Type: to be assigned by IANA.

o Length: 4.

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

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

  * Headend Behavior = 0: H.Encaps. A headend behavior defined in [RFC8986].

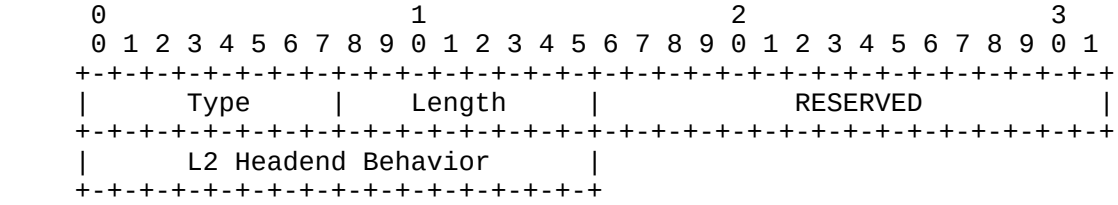
  * Headend Behavior = 1: H.Encaps.Red. A headend behavior defined in [RFC8986].

3.2. 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:



where:

- Type: to be assigned by IANA.

- Length: 4.

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

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

  * L2 Headend Behavior = 0: H.Encaps.L2. A headend behavior defined in [RFC8986].

* L2 Headend Behavior = 1: H.Encaps.L2.Red. A headend behavior defined in [RFC8986].

4. Security Considerations

Procedures and protocol extensions defined in this document do not affect the security considerations discussed in [RFC9830].

5. IANA Considerations

Headend Behavior Sub-TLV (TBD)

L2 Headend Behavior Sub-TLV (TBD)

6. References

6.1. Normative References

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6.2. Informative References

[I-D.ietf-idr-ts-flowspec-srv6-policy] Jiang, W., Liu, Y., Zhuang, S., Mishra, G., and S. Chen, "Traffic Steering using BGP Flowspec with SR Policy", Work in Progress, Internet-Draft, draft-ietf-idr-ts-flowspec-srv6-policy-07, 04 August 2025, <http://www.ietf.org/internet-drafts/draft-ietf-idr-ts-flowspec-srv6-policy-07.txt>.

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