lsvr
Internet-Draft
Intended status: Standards Track
Expires: 30 August 2026

J. Xu, Ed.
L. Zhu, Ed.
C. Wen, Ed.
China Unicom

28 February 2026

BGP-LS-SPF Extensions for SRv6 Policy State Synchronization
draft-xu-lsvr-bgp-ls-spf-srv6-policy-state-00

Abstract

This document defines extensions to BGP-LS-SPF (BGP Link State Shortest Path First) to support synchronization of Segment Routing over IPv6 (SRv6) policy state information. It introduces a new optional Sub-TLV for the SRv6 End.X SID TLV that indicates whether an SRv6 SID is currently active in an SR policy. This enables dynamic interaction between SR policies and BGP-LS-SPF route computation, improving network responsiveness to policy changes.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

Internet-Drafts are working documents of the Internet Engineering Task Force (IETF). Note that other groups may also distribute working documents as Internet-Drafts. The list of current Internet-Drafts is at https://datatracker.ietf.org/drafts/current/.

Internet-Drafts are draft documents valid for a maximum of six months and may be updated, replaced, or obsoleted by other documents at any time. It is inappropriate to use Internet-Drafts as reference material or to cite them other than as "work in progress."

This Internet-Draft will expire on 30 August 2026.

Copyright Notice

Table of Contents

1. Introduction

BGP-LS-SPF [RFC9815] extends BGP for Link-State (LS) distribution and SPF-based route computation. [RFC9514] defines BGP-LS extensions for Segment Routing over IPv6 (SRv6), including the SRv6 End.X SID TLV used to advertise SRv6 SIDs associated with network adjacencies.

In network deployments using BGP-LS-SPF as the underlay routing protocol, there is a need for dynamic interaction between SR policies and the SPF computation process. Currently, BGP-LS-SPF can distribute SRv6 SID information, but it lacks the ability to indicate whether a particular SID is actively being used in an SR policy.

This document defines a new optional Sub-TLV for the SRv6 End.X SID TLV that carries policy state information. This enables BGP-LS-SPF speakers to synchronize the activation state of SRv6 SIDs relative to SR policies, facilitating more intelligent route computation that considers current policy utilization, thereby enabling more flexible traffic steering, load balancing, and other policy implementations.

The key benefits of this extension include:

* Improved convergence during policy changes by providing real-time visibility into SID activation states.

* Enhanced traffic engineering capabilities through policy-aware path selection in the SPF computation.

* Backward compatibility through optional Sub-TLV implementation.

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. SRv6 Policy State Sub-TLV

2.1. Sub-TLV Format

This document defines a new optional Sub-TLV for the SRv6 End.X SID TLV [RFC9514]: the SRv6 Policy State Sub-TLV. The Sub-TLV provides a mechanism to indicate whether an SRv6 SID is currently active in one or more SR policies.

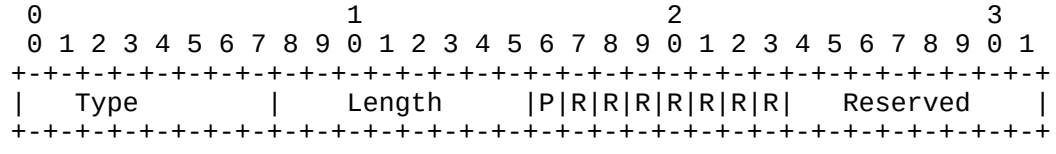

Figure 1: SRv6 Policy State Sub-TLV

where:

Type: 1 octet. TBA.

Length: 1 octet. Value 2.

Flags: 1 octet of flags.

Reserved: 1 octet. MUST be set to zero on transmission and MUST be ignored on receipt [RFC2119].

2.2. Flags Field Description

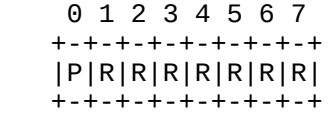

Figure 2: Flags Field of SRv6 Policy State Sub-TLV

The Flags field contains the following bits:

P flag (Policy Active) : Bit 0. When set to 1, indicates that the SRv6 SID is currently active in one or more SR policies. When set to 0, indicates that the SID is not active in any SR policy or the policy state is unknown.

R flags (Reserved) : Bits 1-7. Reserved for future use. SHOULD be set to zero on transmission and SHOULD be ignored on receipt.

3. Operational Considerations

3.1. Policy State Advertisement

The SRv6 Policy State Sub-TLV is included in the SRv6 End.X SID TLV when the advertising node has knowledge of the SR policy state for the corresponding SID. The Sub-TLV is optional and MAY be included or omitted based on local policy and implementation capability.

When the policy state of an SRv6 SID changes (e.g., an SR policy activating or deactivating the SID), the advertising node SHOULD update the corresponding SRv6 End.X SID TLV with the current policy state information. This update follows normal BGP-LS-SPF advertisement procedures.

The absence of the SRv6 Policy State Sub-TLV in an SRv6 End.X SID TLV indicates that policy state information is not available for that SID. Receiving nodes MUST NOT make assumptions about the policy state when the Sub-TLV is absent.

3.2. BGP-LS-SPF Route Computation

BGP-LS-SPF implementations that support this extension MAY use the policy state information during SPF computation to prefer paths containing active SR policy SIDs. The specific algorithm for incorporating policy state into route computation is implementation-dependent and subject to local policy.

Example behavior might include:

* Preferring paths with SIDs marked as active (P-flag set) over paths with inactive SIDs when multiple equal-cost paths exist.

* Triggering SPF recalculation when policy state changes affect currently used paths.

Implementations that do not support this extension will ignore the Sub-TLV and continue with normal SPF computation, maintaining backward compatibility.

3.3. Backward Compatibility

The SRv6 Policy State Sub-TLV is optional. Implementations that do not support this extension will silently ignore the Sub-TLV as per the rules for handling unknown TLVs in [RFC9514]. This ensures backward compatibility with existing BGP-LS-SPF implementations.

Nodes that support this extension but do not receive the Sub-TLV for a particular SID MUST proceed with normal SPF computation without policy state information for that SID.

4. Security Considerations

This extension introduces a new Sub-TLV that carries policy state information. The security considerations for BGP-LS [RFC9552] and BGP-LS-SPF [RFC9815] apply to this document.

Additionally, the following considerations apply:

* False policy state advertisements could lead to suboptimal routing or traffic blackholing. Implementations SHOULD apply appropriate validation to policy state information when possible.

* The policy state information may reveal details about network operational policies. In environments where this information is sensitive, implementations SHOULD consider filtering policy state advertisements to unauthorized peers.

* The mechanisms described in [RFC5925] for securing BGP sessions SHOULD be used to protect the integrity and authenticity of policy state advertisements.

5. IANA Considerations

IANA is requested to assign a new value in the "BGP-LS SRv6 End.X SID TLV Sub-TLVs" registry under the "Border Gateway Protocol (BGP) Parameters" group.

The requested assignment is: Value: TBA Description: SRv6 Policy State

6. Normative References

[RFC9815] Patel, K., Lindem, A., Zandi, S., and W. Henderickx, "BGP Link State (BGP-LS) Shortest Path First (SPF) Routing", RFC 9815, DOI 10.17487/RFC9815, July 2025, <https://www.rfc-editor.org/info/rfc9815>.

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, DOI 10.17487/RFC2119, March 1997, <https://www.rfc-editor.org/info/rfc2119>.

[RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in RFC 2119 Key Words", BCP 14, RFC 8174, DOI 10.17487/RFC8174, May 2017, <https://www.rfc-editor.org/info/rfc8174>.

[RFC9514] Dawra, G., Filsfils, C., Talaulikar, K., Ed., Chen, M., Bernier, D., and B. Decraene, "Border Gateway Protocol - Link State (BGP-LS) Extensions for Segment Routing over IPv6 (SRv6)", RFC 9514, DOI 10.17487/RFC9514, December 2023, <https://www.rfc-editor.org/info/rfc9514>.

Authors' Addresses

Jie Xu (editor)
China Unicom
Beijing
China
Email: xuj556@chinaunicom.cn

Lin Zhu (editor)
China Unicom
Beijing
China
Email: zhul14@chinaunicom.cn

Chenyang Wen (editor)
China Unicom
Beijing
China
Email: wency15@chinaunicom.cn