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BGP SR Policy Extensions for metric

Abstract

SR Policy candidate paths can be represented in BGP UPDATE messages. BGP can then be used to propagate the SR Policy candidate paths to the headend nodes in the network. After SR Policy is installed on the ingress node, the packets can be steered into SR Policy through route selection. Therefore, route selection may be performed on the ingress node of the SR Policy. If there are multiple routes to the same destination, the route selection node can select routes based on the local policy. The local policy may use the IGP metric of the selected path, which is the IGP Metric of the SR Policy. Thus the BGP UPDATE message need carry the metric of each segment list of the SR Policy Candidate Path, which can be used in path selection of routing.

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 BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

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 14 September 2023.

Table of Contents

1. Introduction

[I-D.ietf-idr-segment-routing-te-policy]defines SR Policy and Tunnel Encapsulation Attributes. It defines the segment list of the SR policies. Each segment list of an SR Policy is an segment routing path, which may be calculated by path compuation element and delivered to the head node of the device by BGP Update Message. On the ingress node, when steer traffic to an SR Policy, the ingress node may need to select between multiple SR Policy paths. And the selection policy may need the path metric information. Therefore, BGP needs to carry the metric of each path when delivering the semgnet list of the SR Policy through Update messages to facilitate route selection on the device.

2. Terminology

The following terminology is used in this document.

SR Policy: An ordered list of segments.

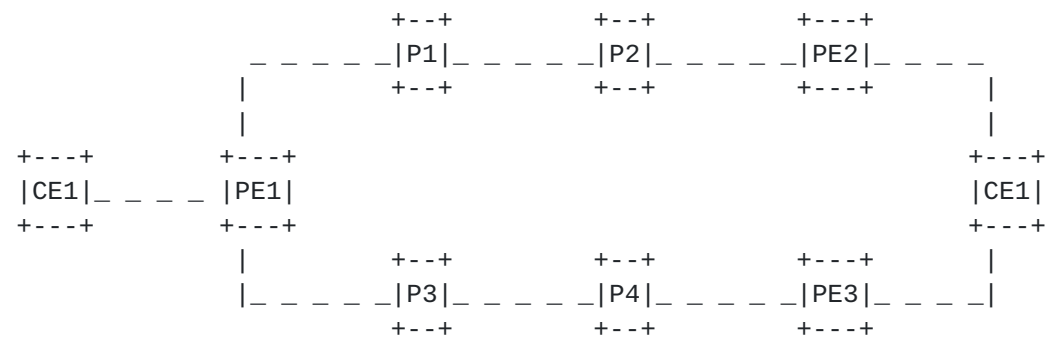
Candidate Path: the unit for signaling of an SR Policy to a headend via protocol PCEP or BGP, which is defined in [I-D.ietf-pce-segment-routing-policy-cp] and [I-D.ietf-idr-segment-routing-te-policy].

SRPM: SR Policy Module.

3. Motivation

In route selection scenarios, the metric of the SR Policy segment list may be required.

The specific scenarios are as follows:



On PE1, the route prefix to CE1 has two diffierent next hop, PE2 and PE3. The next hop to PE1 uses an SR Policy1 on PE1, the endpoint of SR Policy1 is PE2. The next hop to PE2 uses an SR Policy2 on PE1, the endpoint of SR Policy2 is PE3. The prefix to CE1 want to choose a next hop based on the IGP metric of the route PE1 to PE2 and PE1 and PE3, which uses SR Policy1 and SR Policy2. Thus need the IGP metric of SR Policy semgent list on PE1.

4. SR Policy and Tunnel Encapsulation Attribute Update

As the metric is defined, the tunnel attribute encapsulation of the BGP SR Policy needs to be updated.

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

Policy Candidate Path Name

Explicit NULL Label Policy (ENLP)

Segment List

Weight

Metric

Segment

Segment

....

....

Where metric indicates the metric for the segment list.

4.1. Metric sub-TLV

A new sub-TLV called Metric sub-TLV is defined. Metric sub-TLV specifies the metric of an SR policy Segment List. Each sub-TLV is encoded as shown in Figure 1. More than one Metric Sub-TLVs may be present in one Segment List to refer to the metric values of different metric type.

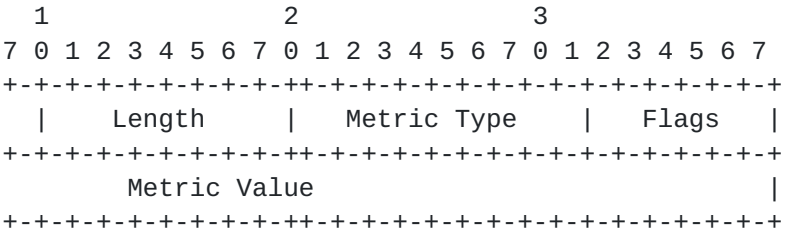


Figure 1: Metric Sub-TLV

* Type: Metric, 1 octet, TBD.

* Length: 6 octets.

* Metric Type: 1-octet field which identifies the type of the metric being used. The metric type code points are listed as follows. The "Metric Type" code point is the same as the SR Segment List Metric Sub-TLV "Metric Type" defined in [I-D.ietf-idr-bgp-ls-sr-policy], and can re-use the IANA registry of it.

Code Point	Metric Type
0	IGP Metric
1	Min Unidirectional Link Delay [RFC7471]
2	TE Metric [RFC3630]
3	Hop Count (refer [RFC5440])
4	SID List Length
5-250	Unassigned
251-255	Private Use (not to be assigned by IANA)

Figure 2: Metric Type Code Point

* Flags: None are defined at this stage. Flags SHOULD be set to zero on transmission and MUST be ignored on receipt.

* Metric Value: 4-octet value which indicates the metric of the computed path.

5. Metric process of SR Policy segment list

When SR Policy headend get the SR Policy segment list with metric, how to process the metric is local policy.

The active candidate path of SR Policy may have several segment lists, each segment list may have different metric type and value. The candidate path can choose one metric type to use. If the metric value of the Segment Lists in the candidate path is different, the candidate path can use the maximum value as the metric of candidate path. And the SR Policy can use the metric type and metric value of the active candidate path.

6. Acknowledgements

TBD.

7. IANA Considerations

This document defines a new Sub-TLV in requests registries "SR Policy List Sub- TLVs" [I-D.ietf-idr-segment-routing-te-policy]:

Value	Description	Reference
TBD	Metric	This document

Figure 3: Metric sub-TLV

8. Security Considerations

These extensions to BGP SR Policy do not add any new security issues to the existing protocol.

9. References

[I-D.ietf-idr-bgp-ls-sr-policy] Previdi, S., Talaulikar, K., Dong, J., Gredler, H., and J. Tantsura, "Advertisement of Segment Routing Policies using BGP Link-State", Work in Progress, Internet-Draft, draft-ietf-idr-bgp-ls-sr-policy-00, 9 March 2023, <https://datatracker.ietf.org/doc/html/draft-ietf-idr-bgp-ls-sr-policy-00>.

[I-D.ietf-idr-segment-routing-te-policy] Previdi, S., Filsfils, C., Talaulikar, K., Mattes, P., Jain, D., and S. Lin, "Advertising Segment Routing Policies in BGP", Work in Progress, Internet-Draft, draft-ietf-idr-segment-routing-te-policy-20, 27 July 2022, <https://datatracker.ietf.org/doc/html/draft-ietf-idr-segment-routing-te-policy-20>.

[I-D.ietf-pce-segment-routing-policy-cp] Koldychev, M., Sivabalan, S., Barth, C., Peng, S., and H. Bidgoli, "PCEP extension to support Segment Routing Policy Candidate Paths", Work in Progress, Internet-Draft, draft-ietf-pce-segment-routing-policy-cp-09, 7 March 2023, <https://datatracker.ietf.org/doc/html/draft-ietf-pce-segment-routing-policy-cp-09>.

[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>.

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