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BGP-LS Advertisement of SR Policy Performance Metric
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Abstract

This document describes a way to advertise the performance metrics for Traffic Engineering (TE) Policy using BGP Link State (BGP-LS).

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1. Introduction

BGP Link State (BGP-LS) can be used to distribute link-state and traffic engineering (TE) information to external components [RFC9552]. [RFC9857] describes the mechanism for BGP-LS to distribute the information of TE policies.

In some network scenarios, the controller needs to obtain the performance information of TE Policies, which can be used in service placement to meet better customer requirements and utilize network resources more efficiently.

[I-D.ietf-spring-stamp-srpm] describes the procedures for Performance Measurement in SR networks, using STAMP as defined in [RFC8762]. The described procedure is used for SR paths [RFC8402](including SR Policies [RFC9256]).

This document describes a way to advertise the performance metrics for Traffic Engineering (TE) Policy using BGP Link State (BGP-LS).

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. Advertisement of SR Policy Performance Metric

[RFC8571] defines several Link Attribute TLVs for BGP-LS to carry the IGP Traffic Engineering Performance Metric Extensions:

TLV Code Point	Value
-----	-----
1114	Unidirectional Link Delay
1115	Min/Max Unidirectional Link Delay
1116	Unidirectional Delay Variation
1117	Unidirectional Link Loss

The above TLVs can be reused to report performance metrics for TE Policies. They enable reporting for either a specific SID-List or a particular SR candidate path. Therefore, these TLVs may serve as sub-TLVs of the SR Segment List TLV, or alternatively provide performance metrics for the SR Policy at the candidate path level.

When used to describe the performance metric of the SR Policy NLRI, they are carried in the optional non-transitive BGP Path Attribute "BGP-LS Attribute" defined in [RFC9552]. The semantics of the above TLVs comply with [RFC8571], except for that they are extended to describe TE Policies besides IGP links.

The performance metric of SR Policy may be measured at the headend, for example, by using STAMP for SR Policy [I-D.ietf-spring-stamp-srpm]. But the measurement methods are out of the scope of this document.

The existing performance metrics above are all unidirectional. However, there are also requirements to advertise round-trip performance metrics for TE Policies. The BGP-LS extensions for round-trip TE performance metrics are defined in the following section.

3. Extensions for Round-trip TE Performance Metric

3.1. Round-trip Delay TLV

This TLV advertises the average round-trip delay for SR Policy. It can report round-trip delay for either a specific SID-List or a particular SR candidate path. As such, this TLV may function either as a sub-TLV of the SR Segment List TLV or provide round-trip delay for the SR Policy at the candidate path level.

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																													
A RESERVED										Delay																													

where:

- o Type: TBD
- o Length: 4
- o Reserved: Reserved for future use. MUST be set to 0 when sent and MUST be ignored when received.
- o A: Anomalous (A) Bit. Same with the A Bit in Unidirectional Link Delay TLV [RFC8571].
- o Delay: Similar with the Delay filed in Unidirectional Link Delay TLV [RFC8571], except for that the delay is round-trip.

3.2. Min/Max Round-trip Delay TLV

This TLV advertises the minimum and maximum round-trip delay for SR Policy. It can report minimum and maximum round-trip delay for either a specific SID-List or a particular SR candidate path. As such, this TLV may function either as a sub-TLV of the SR Segment List TLV or provide minimum and maximum round-trip delay for the SR Policy at the candidate path level.

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																													
A	RESERVED									Min Delay																													
RESERVED										Max Delay																													

where:

- o Type: TBD
- o Length: 4
- o Reserved: Reserved for future use. MUST be set to 0 when sent and MUST be ignored when received.
- o A: Anomalous (A) Bit. Same with the A Bit in Min/Max Unidirectional Link Delay TLV [RFC8571].
- o Min Delay: Similar with the Min Delay filed in Min/Max Unidirectional Link Delay TLV [RFC8571], except for that the delay is round-trip.
- o Max Delay: Similar with the Max Delay filed in Min/Max Unidirectional Link Delay TLV [RFC8571], except for that the delay is round-trip.

3.3. Round-trip Delay Variation TLV

This TLV advertises the average round-trip delay variation for SR Policy. It can report average round-trip delay variation for either a specific SID-List or a particular SR candidate path. As such, this TLV may function either as a sub-TLV of the SR Segment List TLV or provide average round-trip delay variation for the SR Policy at the candidate path level.

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										Delay Variation																													

where:

- o Type: TBD
- o Length: 4
- o Reserved: Reserved for future use. MUST be set to 0 when sent and MUST be ignored when received.
- o A: Anomalous (A) Bit. Same with the A Bit in Unidirectional Delay Variation TLV [RFC8571].
- o Delay Variation: Similar with the Delay Variation filed in Unidirectional Delay Variation TLV [RFC8571], except for that the delay variation is round-trip.

3.4. Round-trip Loss TLV

This TLV advertises the round-trip loss for SR Policy. It can report round-trip loss for either a specific SID-List or a particular SR candidate path. As such, this TLV may function either as a sub-TLV of the SR Segment List TLV or provide round-trip loss for the SR Policy at the candidate path level.

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	2	3	4	5	6	7	8	9
Type										Length																													
A RESERVED										Loss																													

where:

- o Type: TBD
- o Length: 4
- o Reserved: Reserved for future use. MUST be set to 0 when sent and MUST be ignored when received.
- o A: Anomalous (A) Bit. Same with the A Bit in Unidirectional Link Loss TLV [RFC8571].
- o Loss: Similar with the Link Loss filed in Unidirectional Link Loss TLV [RFC8571], except for that the loss is round-trip.

4. Security Considerations

Procedures and protocol extensions defined in this document do not affect the BGP security model. See the "Security Considerations" section of [RFC4271] for a discussion of BGP security. Also, refer to [RFC4272] and [RFC6952] for analyses of security issues for BGP. Security considerations for acquiring and distributing BGP-LS information are discussed in [RFC9552], [RFC9830] and [RFC9857].

The mechanism proposed in this document is subject to the same vulnerabilities as any other protocol that relies on BGP-LS.

5. Management Considerations

An implementation SHOULD allow the operator to specify neighbors to which Link-State NLRIs will be advertised and from which Link-State NLRIs will be accepted.

An implementation SHOULD allow the operator to control the content of advertisements, such as whether or not to advertise latency, packet loss rate, bidirectional latency, and bidirectional packet loss rate.

An implementation SHOULD allow the operator to control advertisement thresholds to avoid frequent announcements.

6. IANA Considerations

This document defines the following TLVs for BGP-LS.

TLV Code Point	Value

TBD	Round-trip Delay
TBD	Min/Max Round-trip Delay
TBD	Round-trip Variation
TBD	Round-trip Loss

7. References

7.1. Normative References

[RFC2119] Bradner, S., "Key words for use in RFCs to Indicate Requirement Levels", BCP 14, RFC 2119, March 1997.

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7.2. Informative References

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