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April 24, 2017

BGP-LS Advertisement of IGP Traffic Engineering Performance Metric Extensions
draft-ietf-idr-te-pm-bgp-05

Abstract

This document defines new BGP-LS TLVs in order to carry the IGP Traffic Engineering Extensions defined in IS-IS and OSPF protocols.

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 RFC 2119 [RFC2119].

In this document, these words will appear with that interpretation only when in ALL CAPS. Lower case uses of these words are not to be interpreted as carrying RFC-2119 significance.

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1. Introduction

BGP-LS ([RFC7752]) defines NLRI and attributes in order to carry link-state information. New BGP-LS Link-Attribute TLVs are required in order to carry the Traffic Engineering Metric Extensions defined in [RFC7810] and [RFC7471].

2. Link Attribute TLVs for TE Metric Extensions

The following new Link Attribute TLVs are defined:

TLV Type	Value
1104 (Suggested)	Unidirectional Link Delay
1105 (Suggested)	Min/Max Unidirectional Link Delay
1106 (Suggested)	Unidirectional Delay Variation
1107 (Suggested)	Unidirectional Packet Loss
1108 (Suggested)	Unidirectional Residual Bandwidth
1109 (Suggested)	Unidirectional Available Bandwidth
1110 (Suggested)	Unidirectional Bandwidth Utilization

3. TLV Details

3.1. Unidirectional Link Delay TLV

This TLV advertises the average link delay between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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:

Figure 1

Type: TBA (suggested value: 1104).

Length: 4.

3.2. Min/Max Unidirectional Link Delay TLV

This sub-TLV advertises the minimum and maximum delay values between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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:

Figure 2

Type: TBA (suggested value: 1105).

Length: 8.

3.3. Unidirectional Delay Variation TLV

This sub-TLV advertises the average link delay variation between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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:

Figure 3

Type: TBA (suggested value: 1106).

Length: 4.

3.4. Unidirectional Link Loss TLV

This sub-TLV advertises the loss (as a packet percentage) between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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   |                 Link Loss                     |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

where:

Type: TBA (suggested value: 1107).

Length: 4.

3.5. Unidirectional Residual Bandwidth TLV

This sub-TLV advertises the residual bandwidth between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                         Residual Bandwidth                    |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

where:

Type: TBA (suggested value: 1108).

Length: 4.

3.6. Unidirectional Available Bandwidth TLV

This sub-TLV advertises the available bandwidth between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                      Available Bandwidth                      |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

where:

Figure 4

Type: TBA (suggested value: 1109).

Length: 4.

3.7. Unidirectional Utilized Bandwidth TLV

This sub-TLV advertises the bandwidth utilization between two directly connected IGP link-state neighbors. The semantic of the TLV is described in [RFC7810] and [RFC7471].

```
 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              |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                     Utilized Bandwidth                        |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

where:

Figure 5

Type: TBA (suggested value: 1110).

Length: 4.

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 analysis of security issues for BGP.

The TLVs introduced in this document are used to propagate IGP defined information ([RFC7810] and [RFC7471].) These TLVs represent the state and resources availability of the IGP link. The IGP

instances originating these TLVs are assumed to have all the required security and authentication mechanism (as described in [RFC7810] and [RFC7471]) in order to prevent any security issue when propagating the TLVs into BGP-LS.

5. IANA Considerations

This document requests assigning code-points from the registry "BGP-LS Node Descriptor, Link Descriptor, Prefix Descriptor, and Attribute TLVs" for the new Link Attribute TLVs deefined in the table here below:

TLV code-point	Value
1104 (Suggested)	Unidirectional Link Delay
1105 (Suggested)	Min/Max Unidirectional Link Delay
1106 (Suggested)	Unidirectional Delay Variation
1107 (Suggested)	Unidirectional Packet Loss
1108 (Suggested)	Unidirectional Residual Bandwidth
1109 (Suggested)	Unidirectional Available Bandwidth
1110 (Suggested)	Unidirectional Bandwidth Utilization

6. Acknowledgements

TBD

7. References

7.1. Normative References

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7.2. Informative References

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