Internet Engineering Task Force (IETF)
Request for Comments: 8571
Category: Standards Track
ISSN: 2070-1721

L. Ginsberg, Ed.
Cisco Systems, Inc.
S. Previdi
Q. Wu
Huawei
J. Tantsura
Apstra, Inc.
C. Filsfils
Cisco Systems, Inc.

March 2019

BGP - Link State (BGP-LS) Advertisement of IGP Traffic Engineering Performance Metric Extensions

Abstract

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

Status of This Memo

This is an Internet Standards Track document.

This document is a product of the Internet Engineering Task Force (IETF). It represents the consensus of the IETF community. It has received public review and has been approved for publication by the Internet Engineering Steering Group (IESG). Further information on Internet Standards is available in Section 2 of RFC 7841.

Information about the current status of this document, any errata, and how to provide feedback on it may be obtained at https://www.rfc-editor.org/info/rfc8571.

Table of Contents

1. Introduction 2
2. Link Attribute TLVs for TE Metric Extensions 3
2.1. Unidirectional Link Delay TLV 3
2.2. Min/Max Unidirectional Link Delay TLV 4
2.3. Unidirectional Delay Variation TLV 4
2.4. Unidirectional Link Loss TLV 5
2.5. Unidirectional Residual Bandwidth TLV 5
2.6. Unidirectional Available Bandwidth TLV 6
2.7. Unidirectional Utilized Bandwidth TLV 6
2.8. Mappings to IGP Source Sub-TLVs 7
3. Security Considerations 7
4. IANA Considerations 8
5. References 8
5.1. Normative References 8
5.2. Informative References 9
Acknowledgements 9
Contributors 9
Authors' Addresses 10

1. Introduction

BGP - Link State (BGP-LS) [RFC7752] defines Network Layer Reachability Information (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 [RFC8570] and [RFC7471].

2. Link Attribute TLVs for TE Metric Extensions

The following new Link Attribute TLVs are defined:

TLV Code Point	Value
1114	Unidirectional Link Delay
1115	Min/Max Unidirectional Link Delay
1116	Unidirectional Delay Variation
1117	Unidirectional Link Loss
1118	Unidirectional Residual Bandwidth
1119	Unidirectional Available Bandwidth
1120	Unidirectional Utilized Bandwidth

TLV formats are described in detail in the following subsections. TLV formats follow the rules defined in [RFC7752].

2.1. Unidirectional Link Delay TLV

This TLV advertises the average link delay between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

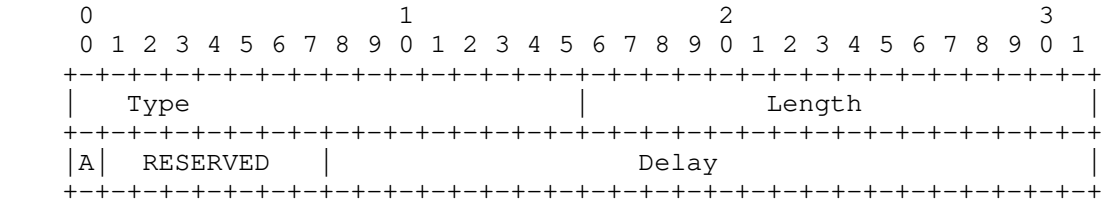

Figure 1

where:

Type: 1114

Length: 4

2.2. Min/Max Unidirectional Link Delay TLV

This TLV advertises the minimum and maximum delay values between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

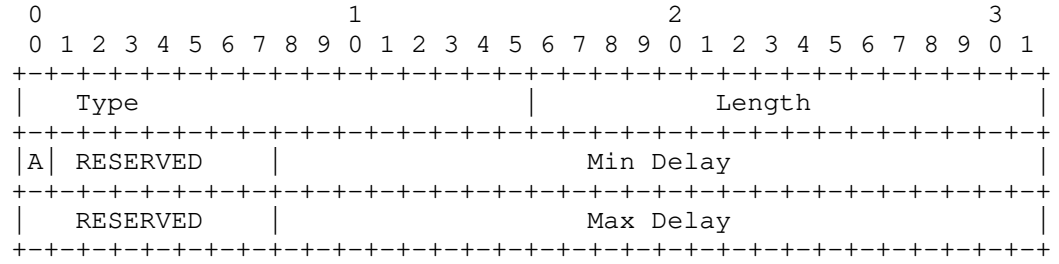

Figure 2

where:

Type: 1115

Length: 8

2.3. Unidirectional Delay Variation TLV

This TLV advertises the average link delay variation between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

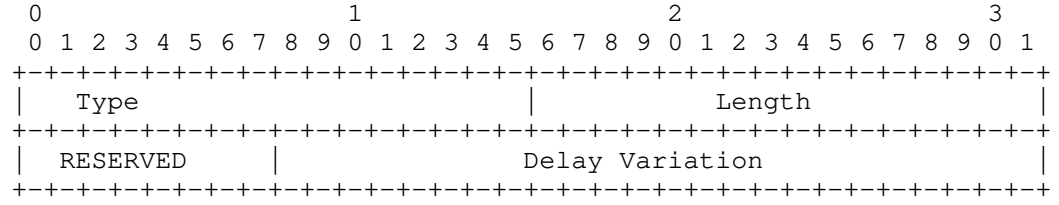

Figure 3

where:

Type: 1116

Length: 4

2.4. Unidirectional Link Loss TLV

This TLV advertises the loss (as a packet percentage) between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

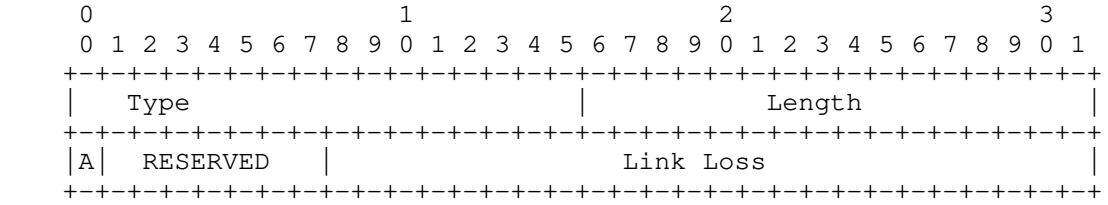

Figure 4

where:

Type: 1117

Length: 4

2.5. Unidirectional Residual Bandwidth TLV

This TLV advertises the residual bandwidth between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

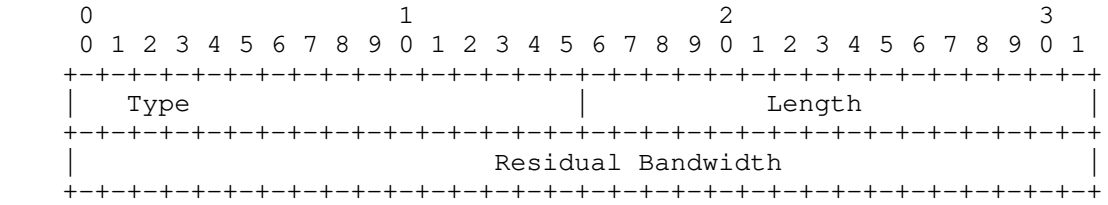

Figure 5

where:

Type: 1118

Length: 4

2.6. Unidirectional Available Bandwidth TLV

This TLV advertises the available bandwidth between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

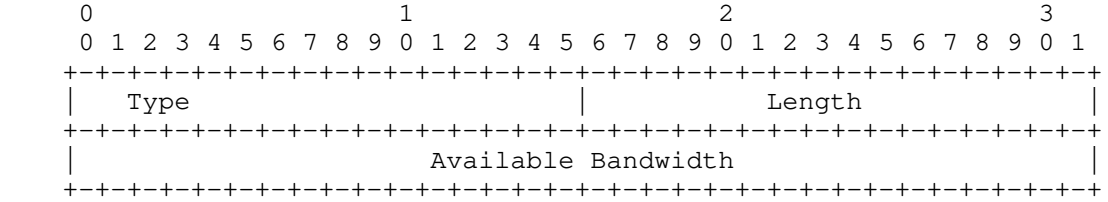

Figure 6

where:

Type: 1119

Length: 4

2.7. Unidirectional Utilized Bandwidth TLV

This TLV advertises the bandwidth utilization between two directly connected IGP link-state neighbors. The semantics and values of the fields in the TLV are described in [RFC8570] and [RFC7471].

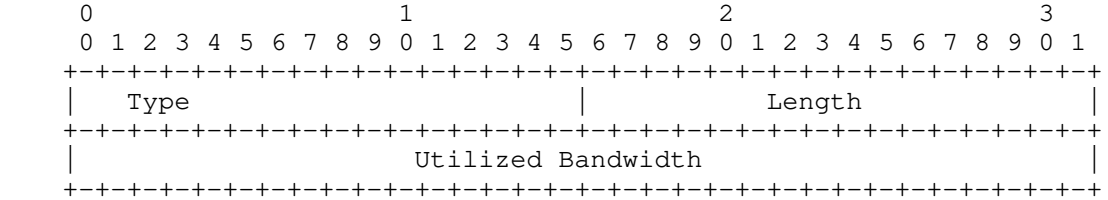

Figure 7

where:

Type: 1120

Length: 4

2.8. Mappings to IGP Source Sub-TLVs

This section documents the mappings between the Link Attribute TLVs defined in this document and the corresponding advertisements sourced by the IGPs.

For OSPFv2 and OSPFv3, the advertisements are defined in [RFC7471]. For IS-IS, the advertisements are defined in [RFC8570].

Attribute Name	IS-IS Sub-TLV	OSPFv2/OSPFv3 Sub-TLV
Unidirectional Link Delay	33	27
Min/Max Unidirectional Link Delay	34	28
Unidirectional Delay Variation	35	29
Unidirectional Link Loss	36	30
Unidirectional Residual Bandwidth	37	31
Unidirectional Available Bandwidth	38	32
Unidirectional Utilized Bandwidth	39	33

Figure 8

3. 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 [RFC7752].

The TLVs introduced in this document are used to propagate the Traffic Engineering Metric Extensions defined in [RFC8570] and [RFC7471]. These TLVs represent the state and resource availability of the IGP link. It is assumed that the IGP instances originating these TLVs will support all the required security and authentication mechanisms (as described in [RFC8570] and [RFC7471]) in order to prevent any security issues when propagating the TLVs into BGP-LS.

The advertisement of the link attribute information defined in this document presents no additional risk beyond that associated with the existing link attribute information already supported in [RFC7752].

4. IANA Considerations

IANA has made assignments in the "BGP-LS Node Descriptor, Link Descriptor, Prefix Descriptor, and Attribute TLVs" registry for the new Link Attribute TLVs as listed below:

TLV Code Point	Description
1114	Unidirectional Link Delay
1115	Min/Max Unidirectional Link Delay
1116	Unidirectional Delay Variation
1117	Unidirectional Link Loss
1118	Unidirectional Residual Bandwidth
1119	Unidirectional Available Bandwidth
1120	Unidirectional Utilized Bandwidth

5. References

5.1. Normative References

[RFC7471] Giacalone, S., Ward, D., Drake, J., Atlas, A., and S. Previdi, "OSPF Traffic Engineering (TE) Metric Extensions", RFC 7471, DOI 10.17487/RFC7471, March 2015, <https://www.rfc-editor.org/info/rfc7471>.

[RFC7752] Gredler, H., Ed., Medved, J., Previdi, S., Farrel, A., and S. Ray, "North-Bound Distribution of Link-State and Traffic Engineering (TE) Information Using BGP", RFC 7752, DOI 10.17487/RFC7752, March 2016, <https://www.rfc-editor.org/info/rfc7752>.

[RFC8570] Ginsberg, L., Ed., Previdi, S., Ed., Giacalone, S., Ward, D., Drake, J., and Q. Wu, "IS-IS Traffic Engineering (TE) Metric Extensions", RFC 8570, DOI 10.17487/RFC8570, March 2019, <https://www.rfc-editor.org/info/rfc8570>.

5.2. Informative References

[RFC4271] Rekhter, Y., Ed., Li, T., Ed., and S. Hares, Ed., "A Border Gateway Protocol 4 (BGP-4)", RFC 4271, DOI 10.17487/RFC4271, January 2006, <https://www.rfc-editor.org/info/rfc4271>.

[RFC4272] Murphy, S., "BGP Security Vulnerabilities Analysis", RFC 4272, DOI 10.17487/RFC4272, January 2006, <https://www.rfc-editor.org/info/rfc4272>.

[RFC6952] Jethanandani, M., Patel, K., and L. Zheng, "Analysis of BGP, LDP, PCEP, and MSDP Issues According to the Keying and Authentication for Routing Protocols (KARP) Design Guide", RFC 6952, DOI 10.17487/RFC6952, May 2013, <https://www.rfc-editor.org/info/rfc6952>.

Acknowledgements

The authors wish to acknowledge comments from Ketan Talaulikar.

Contributors

The following people have contributed substantially to this document and should be considered coauthors:

Saikat Ray
Individual
Email: raysaikat@gmail.com

Hannes Gredler
RtBrick Inc.
Email: hannes@rtbrick.com

Authors' Addresses

Les Ginsberg (editor)
Cisco Systems, Inc.
United States of America

Email: ginsberg@cisco.com

Stefano Previdi
Huawei
Italy

Email: stefano@previdi.net

Qin Wu
Huawei
101 Software Avenue, Yuhua District
Nanjing, Jiangsu 210012
China

Email: bill.wu@huawei.com

Jeff Tantsura
Apstra, Inc.
United States of America

Email: jefftant.ietf@gmail.com

Clarence Filsfils
Cisco Systems, Inc.
Brussels
Belgium

Email: cfilsfil@cisco.com