

Network Working Group
Internet Draft
Intended status: Standards Track
Expires: October 8, 2022

L. Gong
W. Cheng
China Mobile
C. Lin
M. Chen
New H3C Technologies

ZTE Corporation
April 8, 2022

Advertising Exclusive Links for Flex-Algorithm in IGP
draft-gong-lsr-exclusive-link-for-flex-algo-00

Abstract

This document proposes a method to advertise exclusive links for Flex-Algorithm in IGP.

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), its areas, and its working groups. Note that other groups may also distribute working documents as Internet-Drafts.

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."

The list of current Internet-Drafts can be accessed at <http://www.ietf.org/ietf/lid-abstracts.txt>

The list of Internet-Draft Shadow Directories can be accessed at <http://www.ietf.org/shadow.html>

This Internet-Draft will expire on February 1, 2022.

Copyright Notice

Copyright (c) 2022 IETF Trust and the persons identified as the document authors. All rights reserved.

Internet-Draft Advertise Exclusive Link for Flex-Algo April 2022

This document is subject to [BCP 78](#) and the IETF Trust's Legal Provisions Relating to IETF Documents (<http://trustee.ietf.org/license-info>) in effect on the date of publication of this document. Please review these documents carefully, as they describe your rights and restrictions with respect to this document. Code Components extracted from this document must include Simplified BSD License text as described in Section 4.e of the [Trust Legal Provisions](#) and are provided without warranty as described in the Simplified BSD License.

Table of Contents

1.	Introduction	2
1.1.	Requirements Language	2
2.	Problem Statement	3
3.	New Extension to Prune Links	3
4.	Backward Compatibility Method in IS-IS	5
5.	Security Considerations	5
6.	IANA Considerations	5
7.	References	5
7.1.	Normative References	5
7.2.	Informative References	5
8.	Acknowledgments	6
	Authors' Addresses	7

[1.](#) Introduction

Flexible Algorithm (Flex-Algorithm) allows IGP to compute constraint-based paths. [[I-D.ietf-lsr-flex-algo](#)] specifies the usage of Flex-Algorithm in Segment Routing (SR) data planes - SR MPLS and SRv6. [[I-D.ietf-lsr-ip-flexalgo](#)] extends the Flex-Algorithm for native IPv4 and IPv6 data planes.

In some scenarios, exclusive links may be deployed for Flex-Algorithm, but not for best-effort service. However, these links cannot be pruned in normal SPF calculation, and unexpected flows may be steered into these links.

This document proposes a method to advertise exclusive links for Flex-Algorithm in IGP.

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. Problem Statement

Flex-Algorithm allows IGP to compute the best paths along the constrained topology.

A network topology is shown in Figure 1. Node A, B, C and D have an extra link between each other. These links have EAG attribute of "red" color.

Flex-Algorithm 128 are enable on Node A, B, C and D, with metric-type of IGP cost and EAG rule of including "red". The topology used by Flex-Algorithm 128 is shown in Figure 2.

Flex-Algorithm 128 are used to transmit particular flows, such as network slice. The links used by Flex-Algorithm 128 are sub-interfaces with dedicated queues for bandwidth guarantee. So it is expected that only the particular flows are transmitted on these links using Flex-Algorithm 128. However, these links are also contained in the default topology used by normal SPF calculation, and unexpected flows of best-effort service may be steered into these links. Therefore, it is a problem that exclusive links for Flex-Algorithm cannot be pruned in normal SPF calculation.

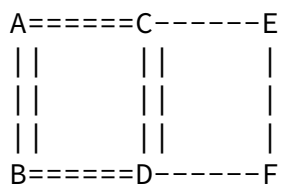
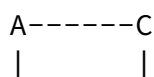


Figure 1



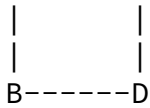
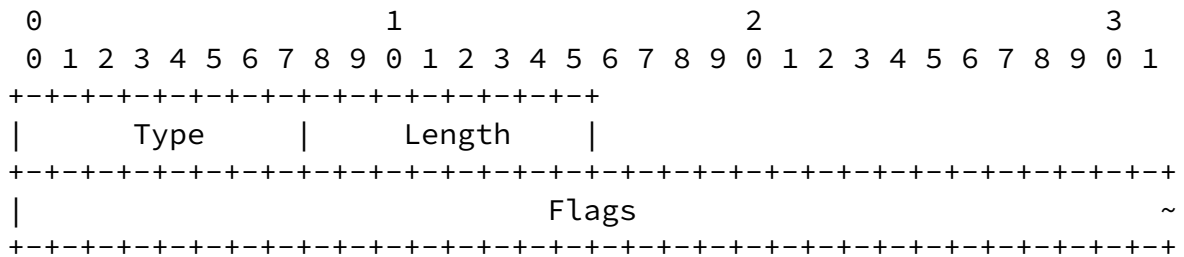


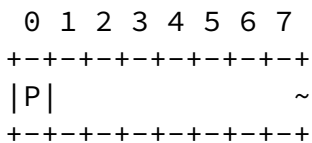
Figure 2

3. New Extension to Prune Links

A new Link Flags sub-TLV is defined in IS-IS. The format is as the following:



- o Type: TBD.
- o Length: Variable, dependent on the size of the Flags field. MUST be a multiple of 4 octets.
- o Flags: Following flags are currently defined.



- o P-Flag: Pruning the link during SPF calculation.

The Link Flags sub-TLV is advertised in the TLVs/sub-TLVs below:

- o TLV-22 (Extended IS reachability) [[RFC5305](#)]
- o TLV-222 (MT-ISN) [[RFC5120](#)]
- o TLV-23 (IS Neighbor Attribute) [[RFC5311](#)]
- o TLV-223 (MT IS Neighbor Attribute) [[RFC5311](#)]

The Link Flags sub-TLV with P-Flag can be advertised for the exclusive links used by Flex-Algorithm, so that these links will be pruned during normal SPF calculation.

When using the Link Flags sub-TLV, all nodes in the same area or level must support this sub-TLV. Otherwise routing loops may be caused by topology inconsistencies.

Relevant extensions for OSPF will be included in the future version of this draft.

[4.](#) Backward Compatibility Method in IS-IS

As specified in [[RFC5305](#)], if a link is advertised with the maximum link metric ($2^{24} - 1$), this link MUST NOT be considered during the normal SPF computation in IS-IS.

Instead of advertising the Link Flags sub-TLV in [Section 3](#), the metrics of exclusive links for Flex-Algorithm may be advertised by the value of ($2^{24} - 1$). It can also lead to the pruning of these links in normal SPF computation.

If the associated Flex-Algorithm needs to use IGP-Cost as its metric-type in path calculation, the Flex-Algorithm-associated Generic Metric sub-TLV defined in [[I-D.cheng-lsr-flex-algo-metric](#)] can be advertised to carry the actual value.

[5.](#) Security Considerations

TBD

[6.](#) IANA Considerations

Link Flags sub-TLV (TBD)

[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.
- [RFC8174] Leiba, B., "Ambiguity of Uppercase vs Lowercase in [RFC 2119](#) Key Words", [BCP 14](#), [RFC 8174](#), May 2017
- [I-D.ietf-lsr-flex-algo] Psenak, P., Hegde, S., Filsfils, C., Talaulikar, K., and A. Gulko, "IGP Flexible Algorithm", [draft-ietf-lsr-flex-algo-18](#) (work in progress), October 2021.

7.2. Informative References

- [I-D.ietf-lsr-ip-flexalgo] Britto, W., Hegde, S., Kaneriya, P., Shetty, R., Bonica, R., and P. Psenak, "IGP Flexible Algorithms (Flex- Algorithm) In IP Networks", [draft-ietf-lsr-ip-flexalgo-04](#) (work in progress), December 2021.

Gong, et al.

Expires October, 2022

[Page 5]

Internet-Draft

Advertise Exclusive Link for Flex- Algo

April 2022

- [RFC5120] Przygienda, T., Shen, N., and N. Sheth, "M-ISIS: Multi Topology (MT) Routing in Intermediate System to Intermediate Systems (IS-ISs)", [RFC 5120](#), DOI 10.17487/RFC5120, February 2008, <<https://www.rfc-editor.org/info/rfc5120>>.
- [RFC5305] Li, T. and H. Smit, "IS-IS Extensions for Traffic Engineering", [RFC 5305](#), DOI 10.17487/RFC5305, October 2008, <<https://www.rfc-editor.org/info/rfc5305>>.
- [RFC5311] McPherson, D., Ed., Ginsberg, L., Previdi, S., and M. Shand, "Simplified Extension of Link State PDU (LSP) Space for IS-IS", [RFC 5311](#), DOI 10.17487/RFC5311, February 2009, <<https://www.rfc-editor.org/info/rfc5311>>.
- [I-D.cheng-lsr-flex-algo-metric] Cheng, W, "Advertisement of Dedicated Metric for Flexible Algorithm in IGP", [draft-cheng-lsr-flex-algo-metric-00](#) (work in progress), February 2022.

8. Acknowledgments

The authors would like to thank the following for their valuable contributions of this document:

TBD

Gong, et al.

Expires October, 2022

[Page 6]

Internet-Draft

Advertise Exclusive Link for Flex-Algo

April 2022

Authors' Addresses

Liyan Gong
China Mobile

Email: gongliyan@chinamobile.com

Weiqiang Cheng
China Mobile

Email: chengweiqiang@chinamobile.com

Changwang Lin
New H3C Technologies

Email: linchangwang.04414@h3c.com

Mengxiao Chen
New H3C Technologies

Email: chen.mengxiao@h3c.com

Ran Chen
ZTE Corporation

Email: chen.ran@zte.com.cn