

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

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**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.

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[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.

```
A=====C-----E
||         ||         |
||         ||         |
||         ||         |
B=====D-----F
```

Figure 1

```
A-----C
|         |
|         |
|         |
B-----D
```

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:


```

      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      |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|                                                           Flags
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+

```

- 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.

```

      0 1 2 3 4 5 6 7
+---+---+---+---+---+---+
|P|                               ~
+---+---+---+---+---+---+

```

- 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

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8. Acknowledgments

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

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