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             Advertising Exclusive Links for Flex-Algorithm in IGP
                 draft-gong-lsr-exclusive-link-for-flex-algo-01

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 inconsistences.

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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7.2. Informative References

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