Extended procedures and Considerations for Loop Free Alternatives

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Extended Procedures for LFA

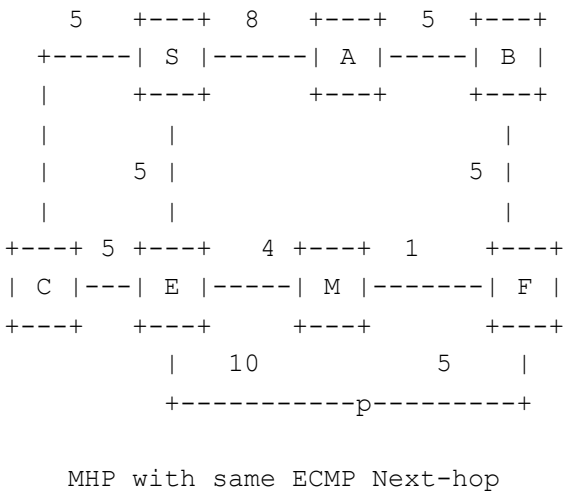
Why ?

This document intends to provide clarifications, additional considerations to RFC5286, to address a few coverage and operational observations. In the area of –

- Multi-Homed Prefixes handling (where coverage can be improved with no cost)
  - IS-IS ATT bit considerations in L1 Area
- Handling Links with MAX_METRIC configured
- MT Considerations and Applicability Statement

MHP Handling

RFC 5286 also allows for the router to simplify the multi-homed prefix calculation by assuming that the MHP is solely attached to the router that was its pre-failure optimal point of attachment and also notes on potential lower coverage. This can be improved in some cases as shown below -



MHP with same ECMP Next-hop

- Prefix P is Advertised from Node E & F
- With Simplified approach, P will get Link Protection through NBR C (though NP is possible through NBR A)
- Node E and Node F both are pre-failure optimal point of attachments and share same next-hop ➔ Hence protections can be compared (what A provides to F to what C provides to E) and can inherit the better alternative to P.

In summary –

- if there are multiple pre-failure points of attachment for a MHP and
- primary next-hop of a MHP is same as that of the primary next-hop of the router that was pre-failure optimal point of attachment

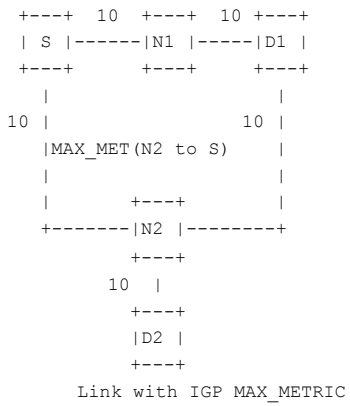
One can have provide better protection to MHP without incurring any additional computation cost.

IS-IS ATT Bit Considerations and L1 Area Default Route Computation

- a default route needs to be added in Level1 (L1) router to the closest reachable Level1/ Level2 (L1/L2) router in the network advertising ATT (attach) bit in its LSP-0 fragment
- The base LFA specification [RFC5286] does not specify any procedure for computing LFA for a default route in IS-IS L1 area.
- Potentially one MAY consider a default route is being advertised from the boarder L1/L2 router where ATT bit is set and can do LFA computation for the default route.
- But, when multiple ECMP L1/L2 routers are reachable in an L1 area corresponding best LFAs SHOULD be given for each primary next-hop associated with default route (**above ECMP MHP considerations apply here**)

Links with IGP MAX_METRIC

Section 3.5 and 3.6 of [RFC5286] describes procedures for excluding nodes and links from use in alternate paths based on the maximum link metric and can lower the coverage (where it need not).



Link with IGP MAX_METRIC

- The S-N2 link has a cost of 10 in the direction from S to N2, and a cost of MAX_METRIC rom N2 to S (0xffffff /2^24 - 1 for IS- IS and 0xffff for OSPF) for a specific end to end Traffic Engineering (TE) requirement of the operator
- At node S, D1 is reachable through N1 with cost 20, and D2 is reachable through N2 with cost 20.
- Even though neighbor N2 satisfies basic loop-free condition for D1 this could be excluded as potential alternative because of the current exclusions as specified in section 3.5 and 3.6 procedure of [RFC5286].
- **But, as the primary traffic destined to D2 is continue to use the link and hence irrespective of the reverse metric in this case, the same link MAY be used as a potential LFA for D1.**
- **Alternatively, reverse metric of the link MAY be configured with MAX_METRIC-1, so that the link can be used as an alternative while meeting the TE requirements.**

LFA – Multi Topology Considerations

- Section 6.2 and 6.3.2 of [RFC5286] state that multi-topology OSPF and ISIS are out of scope for that specification.
- This Doc Clarifies - As for each MT ID, a separate shortest path tree (SPT) is built with topology specific adjacencies, the LFA principles laid out in [RFC5286] are actually applicable for MT IS-IS [RFC5120] LFA SPF
  - identifying the eligible-set of neighbors for each LFA computation (Per MT-ID) – by the presence of IGP ADJ on that MT-ID + Admin restrictions
- Similarly it is also applicable for OSPF [RFC4915] [MT-OSPF] or different AFs in multi instance OSPFv3 [RFC5838].
- However for MT IS-IS, if a default topology is used with MT-ID 0 and both IPv4 [RFC5305] and IPv6 routes/AFs [RFC5308] are present, then the condition of network congruency is applicable for LFA computation as well.
  - congruency refers to - having same address families provisioned on all the links and all the nodes of the network with MT-ID 0
  - Similar to the primary SPF - with one LFA computation from all eligible neighbors per [RFC5286], all potential alternatives can be computed

Next Steps:

Request for WG adoption..

Thank You!