Segment Routing Flexible Algorithms

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PROBLEM SPACE

- Ability to create different paths in IGP using different metric types such as te-metric/extended-te-metric
- Separating routing planes
- Constraint based path creation in IGP
HIGH-LEVEL SOLUTION

- Segment routing provides mechanisms to advertise Prefix-SIDs based on algorithm
- These Algorithm specific SIDs could follow different metric or different paths
- The SIDs can be used to forward traffic based on application needs
- Algorithm space divided into
  - Standard based 0-127
  - User defined 128-255
- All routers in the IGP domain must consistently define the user defined algorithm
Flexible Algorithm Definition

- Every node advertises the algorithm it supports as part of Router-capability TLV in SR algorithm sub-TLV
- Flexible Algorithm Definition TLV is advertised, by every node or by central controller which is used to ensure consistent definition of the user define algorithm
Flexible Algorithm Definition TLV

- Sub TLV of Router capability TLV

Flags are set to 0 and ignored on receipt when advertised as a sub-tlv of 242

- Algorithm: specifies the particular algorithm
- Metric type: To be used for SPF computation.

Currently supported metric types are extended-te-metric (RFC 7810)
TE-metric (RFC 5305)
Flexible Algorithm Definition TLV

- Sub TLV of Router capability TLV
  - Receiving Router should match the algorithm definition with it’s own
  - In case of conflict
    - Must not compute/install any path for the algorithm
    - Should stop advertising support for the algorithm

- Leaking behavior
  - FAD sub-TLVs are not leaked across levels
  - The definition of algorithm MUST be same across levels
Flexible Algorithm Definition TLV

- Advertised as Top level TLV
  - Central entity advertises the definition of the algorithm to all nodes
  - Receiving Router should match the algorithm definition with it’s local definition if there is local definition.
  - If there is no local definition, Receiving router uses the definition advertised by controller.
- In case of conflict with local definition
  - Must not compute/install any path for the algorithm
  - Should stop advertising support

- Flags field in Flexible algorithm Definition TLV used to control leaking behavior
Sub-TLVs of FAD

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Extended Admin Group

... where:

Type: TBD

Length: variable, dependent on the size of the Extended Admin Group. MUST be a multiple of 4 octets.

Extended Administrative Group: Extended Administrative Group as defined in [RFC7308].
SPF computation

• Separate SPF for each supported algorithm
• In case of conflicts in FAD, must not compute paths for that algorithm
• Nodes that do not support the algorithm are pruned from topology
• Metric type specified in the FAD must be used for computation
• Any exclude link advertisements in FAD should be honored
• SPF restricted to ISIS level
• ‘exit’ L1/L2 router will be selected based on the best path for the Flex-Algo in the local area
Advantages of Flex-Algo

• With a single SID, Traffic engineered paths can be traversed.
• Per-node configuration of flexible algorithm and constraints.
• Facility to avoid per-node configuration when a controller advertises the FAD TLVs
• Easy inter-area / inter-level support with IGP route leaking.
Questions?