Segment-Routing over Forwarding Adjacency Links

<draft-saad-sr-fa-link-00>

Tarek Saad <tsaad@juniper.net>

Vishnu Pavan Beeram <vbeeram@juniper.net>

Colby Barth <cbarth@juniper.net>

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Agenda

- Motivation

- Overview of FA link(s)

- Segment Routing over FA link(s)

- Next steps

Motivation

- Improve scalability by creating a hierarchy of SR path(s)
  - The SR sub-path(s) are used by ingress nodes to instantiate e2e paths
  - Reduce the size of TE topology (e.g. summarization)
- Allow seamless reroute/reoptimization of SR sub-path(s) without impact to e2e SR Path
- Allow stitching of different domain technologies (SR, RSVP, etc.) to provide e2e SR Path
- Provide means to customize per domain SR topology that gets exported outside of the domain

Forwarding Adjacency (FA) links

- Introduced back in RFC4206

- A point-to-point virtual link in LSDB or TED whose endpoints are ingress/egress of underlying FA LSP path

- Forwarding over FA link is bound to one or more underlying FA-LSP(s)

- FA-LSP(s) can be setup using different signaling techniques SR, RSVP or static LSP(s), etc.

- FA link(s) can be assigned Traffic Engineering (TE) parameters

- FA link(s) can be assigned Segment-Routing (SR) segments to enable steering of traffic on them (RFC8402)

FA link creation and management

- FA links and FA-LSP(s) - creation/deletion:
  - Via configuration
  - Via suitable NBI/protocol (PCEP, Netconf, gRPC, etc.)
- FA link state:
  - valid/operational and advertised as long as the underlying LSP path is valid
- FA link TE attributes:
  - Can be dynamically derived from underlying LSP(s)
  - Can be statically overridden

FA link Identification

- FA links can be numbered or (most commonly) unnumbered
- Links descriptors:
  - Local/remote interface address (numbered)
  - Local/remote identifier (for unnumbered links)
- For unnumbered FA link, enough to identify unidirectional link by:
  - Local/remote node descriptor, and
  - Local identifier
- Symmetrical FA links:
  - Co-routed FA forward/reverse links:
    - supported by co-routed underlying LSP(s)
  - Remote identifier link descriptor is required to tie forward/reverse FA links in topology
  - Discovery of FA link remote link ID may be derived from the underlying LSP signaling technology (e.g. RFC3477)

Segment Routing over FA link

- RFC8402 (SR architecture) lightly touches on concept of forwarding adjacencies
- SR enabled FA link allows stitching sub-path(s) so to realize an end-to-end SR path
  - Sub-paths can be be setup by different signaling technique other than SR
- Allows shortening of a large SR Segment-List by compressing one or more slice(s) of the list into a SID carried by FA link
- Reduces the number of segments that an ingress router has to impose to realize an end-to-end path
- FA links are treated as normal link(s) and can leverage existing protocol(s) that distribute link-state to carry the FA link properties

FA Link SR Segments

- IGP FA link(s) SR segment(s):
  - Adj-SID: for forwarding over a specific IGP FA link
  - Parallel Adj-SID (with weight): for (un)equal forwarding over multiple parallel IGP FA link(s)
- BGP FA link SR segment(s):
  - Next-hop Adj-SID: forward over a specific FA link
  - Next-hop Node-SID: forward over any FA link that terminates on the next-hop
  - Next-hop Set-SID: forward over any FA link that terminates on any of the next-hops belonging to a set

Applicability to Interdomain

- Provide intradomain connectivity between ingress/egress border nodes of a domain
  - A mesh of FA link(s) connecting ingress/egress border nodes, or
  - Hub-and-spoke connectivity of FA link(s)
  - Mix of the above
- Allows for exporting customized topologies for different services
  - A topology may be decorated or identified with a specific service or slice (e.g. leverage BGP LS Maps – draft-drake-bess-enhanced-vpn)

Next Steps

- Currently, informational I-D
  - FA link remote ID is not exchanged when underlying LSP is instantiated using SR
  - Currently, investigating ways to identify FA link remote identification discovery when underlying FA LSP is SR
- Solicit feedback from WG

Thank You