PCEP Extension for Stateful Inter-Domain Tunnels

Olivier Dugeon & Julien Meuric (Orange)

Y. Lee (Samsung)

D. Ceccarelli (Cisco)

draft-ietf-pce-stateful-interdomain-07

Update since previous versions

- Version 05:
  - Describe how an inter-domain path could be updated
    - Add a new PCE Notification type & values for that purpose
  - Add new capability for Inter-domain
    - With a new BRPC capability for the Recursive method
    - As an update for the H-PCE capability for the Hierarchical method
  - Update the Inter-Domain Association group
    - To ease the management of Inter-domain paths
- Version 06:
  - Simple refresh with reference update
- Version 07:
  - Introduce the support for SRv6
  - Describe the interoperability between MPLS and SRv6

Inter-domain path management

- An intermediate PCE(i) could request an inter-domain path update
  - Send back to PCE(1) an Inter-domain PCNtf message with value = 1
- An intermediate PCE(i) could withdrawn from this inter-domain path
  - Send back to PCE(1) an Inter-domain PCNtf message with value = 2
- When PCE(1) received the Inter-domain PCNtf message
  - It MUST request a new path by means of Recursive (BRPC) or Hierarchical (H-PCE) method
    - Border Node could be modified during this step
  - Once new path computed, PCE(1) updates the inter-domain path by sending a PCUpd message
    - Former local path must be maintained once process is finished
  - A last, inter-domain PCNtf message with value = 3 is sent by PCE(1) at the end of the process
    - Allow intermediate domain to remove former local path which are no more used

SRv6 support

- RFC9604 allows to request a Binding SID as an SRv6 SID
- Same principle apply for inter-domain path
  - Stitching Label is replaced by an SRv6 Binding SID with End.B6 and / or End.B6.encaps behavior
  - SRv6 End.X SID is used to address the inter-domain link between border nodes
  - RFC9514 (BGP-LS extension for SRv6) is used to collect SRv6 Peer SID
  - Add a new flag in the Inter-domain Capability for the support of SRv6
- Interoperability with MPLS is also supported
  - Refer to draft-ietf-spring-srv6-mpls-interworking and SR-Policy as per RFC8402
  - Define two scenarios for 6toM and Mto6:
    - Depends if the Gateway is located in domain (i) or (i+1)
    - Clear separation of technology loose the capacity to fine select the inter-domain link
    - Keep selection of inter-domain link impose for domain(i+1) to support both MPLS and SRv6 on border node
    - Choice is done on a per bilateral agreement between domain(i) and domain (i+1)

Implementation requirements

- The stitching label principle requires several extensions:
  - A new PCE Capability to announce the inter-domain behavior
  - A new PCE Association Group to associate the local paths identifier to the inter-domain identifier
  - A new PCEP Errors message to manage the Stitching Label exchange
  - New flags for the TE-PATH-BINDING Object to convey the Stitching Label
  - A new PCEP Notification Type & Values to ease the management of the Inter-domain path
- With an open question for the “stitching label” name
  - Which one could reflect both MPLS based and SRv6 stitching:

Stitching SID?

Inter-domain Identifier?

Simply use ***Binding SID?***

Conclusion

- Propose to extend BSID and Association Group to inter-domain
  - To exchange Stitching Label between PCEs and PCE / PCCs
  - To automatically stitch / nest local LSP tunnel to form inter-domain LSP tunnel
  - With the support for SRv6 in addition to MPLS (SR-MPLS and RSVP-TE)
- Applicability
  - Inter-domain LSP tunnels setup by RSVP-TE and/or Segment Routing (SR-MPLS or SRv6)
  - Allow stitching of Segment Routing (SR-MPLS or SRv6) paths and RSVP-TE LSP tunnels for operator independence and inter-operability
  - Targeted use cases
    - inter-domain VPN,
    - Data Centre interconnection,
    - 5G Slicing,
    - Intent-Based Networking …