A Backward Recursive
PCE-initiated Inter-domain
LSP Setup

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Inter-Domain LSP Challenges

• Control and setup of inter-domain LSPs is still a big challenge
  • Peering points are becoming the bottlenecks
    • Overprovisioning is no longer a viable solution
  • A clear demands from providers, especially for end-to-end and Cloud interconnectivity

• Several requirements must be addressed to setup inter-domain LSPs
  • Let each operator manage independently their local LSP
  • Enforce route selection at the peering point
  • Avoid scalability issue to limit RSVP-TE refresh messages
Today’s Tunnel Setup

• Contiguous tunnel is not recommended
  • Security issues
  • Risk to put constraints the following network in the AS chain

• Tunnel stitching or nesting are preferred
  • Allow independent tunnel configuration in each domain
  • Tunnel hierarchy solve scalability issues and allow smoother management

• How to exchange label at inter-domain to stich / nest tunnels ?
  • RSVP-TE is not used between ASBR mostly for security reasons
  • Same problem with Segment Routing

• Proposed solution: stateful BRPC
Stateful BRPC

• Take benefit of recent stateful PCE enhancement
  • Use PCInitiate message for each domain to setup the tunnel as usual
  • Use PCInitiate message between PCE to stich / nest the tunnels
  • PCReport message maintains the synchronisation between the PCEs
  • PCUpdate message could be used to modify the end-to-end tunnel

• Smooth exchange of label at the inter-domain between PCEs
  • Done through a dedicated ‘Stitching Label’
    • Conveyed in ERO and RRO as label sub-object (RFC 3473/4003)
  • Introduced new LSP-TYPE code points
    • Defined in draft-ietf-pce-lsp-setup-type
    • For PCE to PCC LSP setup to request the Stitching Label from the ASBR
    • For PCE to PCE LSP setup to propagate the Stitching Label between ASes
3 Domains

- PKS2: ERO for the AS2 part mask with Path Key
- PKS3: ERO for the AS3 part mask with Path Key
- SL12: Stitching Label used by ASBR1 to identify the traffic coming from ASBR1 that stitch the 2 tunnels
- SL23: Stitching Label used by ASBR3 to identify the traffic coming from ASBR22 that stitch the 2 tunnels

Connectivity Request
- PCInitiate (ERO = [PKS2, PKS3], LSP-TYPE = inter-domain)
- PCInitiate (ERO = [ASBR3, R32, R33], LSP-TYPE = inter-domain)
- PCRpt (RRO = [{LK23, SL23}, R32, R33])
- PCRpt (RRO = [{LK23, SL23}, PKS3])
- PCRpt (RRO = [{LK23, SL23}, ASBR22])

Standard BRPC exchange as per RFC5441
- PCInitiate (ERO = PKS3, LSP-TYPE = inter-domain)
- PCInitiate (ERO = {ASBR3, R32, R33}, LSP-TYPE = inter-domain)
- PCRpt (RRO = [{LK23, SL23}, ASBR21])
- PCRpt (RRO = [{LK12, SL12}, PKS2])
- PCRpt (RRO = [{LK12, SL12}, R32, R33])

AS1
- ASBR1
- IGP-TE
- R11
- SL12
- LK12
- R12

AS2
- ASBR21
- ASBR22
- ASBR3
- ASBR22
- ASBR3
- IGP-TE
- R22
- R23
- SL23
- LK23
- R32
- R33

AS3
- ASBR3
- IGP-TE
- R31
- R32
- R33

Connectivity Ack
Conclusion

• Proposal to extend LSP-TYPE to inter-domain
  • To exchange Stitching Label between PCEs and PCE / PCCs
  • To automatically stitch / nest local LSP to form inter-domain LSP
  • Add new value for LSP-Type errors to manage error cases

• Applicability
  • Per domain LSP setup may be based on RSVP-TE or Segment Routing
  • Allow stitching of Segment Routing paths and RSVP-TE LSP

• Improvement for 01 version
  • Management of PLSP-ID for inter-domain LSP identification
  • Add procedure for Hierarchical PCE
  • Enhance handling of error cases
  • Add Local LSP modification procedure through PCUpd message
  • Add inter-layer scenario
  • Discuss scenario of PCE-allocated stitching label
  • Discuss with others draft on inter-domain LSP