P2MP Policy

draft-voyer-pim-sr-p2mp-policy

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Multicast Evolution

• There is a desire to simplify Next generation complex networks (i.e. 5G transport) from administration and protocol point of view.

• The controller provides an end to end view of the network and simplifies traffic engineering, slicing and monitoring of the end to end SLAs for each slice

• Protocols like SR simplify the underlay by removing the need of LDP/RSVP-TE protocols and use IGP/BGP to signal segments.

• Multicast needs to follow suite

• SR P2MP Policy removes legacy P2MP MPLS protocols like mLDP/RSVP-TE while providing traffic engineering via SR Policy attributes
Brief History

• Work started in Jun 2018 with draft-voyer-sr-p2mp-policy-00

• Presented in Prague IETF

• Last revision was draft-voyer-sr-p2mp-policy-03

• Addressed comments:
  • Split draft in two docs: Stateless Replication segment in SPRING
  • PCE based Tree-building in PIM WG
Relevant Drafts

draft-voyer-pim-sr-p2mp-policy-00

draft-voyer-spring-sr-replication-segment-00

draft-hb-spring-sr-p2mp-policy-yang-01

draft-hsd-pce-sr-p2mp-policy-01

draft-hb-idr-sr-p2mp-policy-00
SR P2MP Segment

- A Point-to-Multipoint (P2MP) segment connects a Root node to a set of Leaf nodes in segment routing domain.

- A P2MP segment contains Replication Segments, each providing forwarding instructions at Root, Transit Nodes and Leaf Nodes.

- It is identified via <ROOT, Tree-ID>

- PCC Initiated: Root and Leaves can be discovered via multicast procedures like NG-MVPN (RFC 6514, 6513) or PIM (Protocol Independent Multicast) on PCC and the relevant information send to the PCE

- PCE Initiated: Root and Leaves can be configure explicitly on the PCE or controller and programmed on the PCC
Replication Segment

• Is the forwarding instructions for the P2MP LSP
  • Label instructions
  • Next-Hop information
  • Fast Reroute instructions

• A Replication segment is defined via following
  • Root: The root of the P2MP segment that the replication segment is for;
  • Tree-ID: Tree that the replication segment is part of;
  • Instance-ID: Unique path-instance ID per <Root, Tree-ID>, it identifies a P2MP LSP
  • Replication-SID: Segment ID for this Replication Segment.
  • Replication-SIDs can’t be stacked as each replication segment can be a egress or transit.

• Two Replication Segments can be connected directly via adjacent nodes or they can be non-adjacent and connected via a SID List (Unicast)
1. The primary path (candidate path 1) is A to C to LEAF D and LEAF E with C being a BUD node
2. B does not support Replication Segment
Example Global Optimization of Candidate path 1

1. The link between B and C is broken
2. Node B can do a FRR through B-G-C
3. The controller can do global optimize the candidate path 1 via G
**Example P2MP Tree**

**Redundancy**

- **SR P2MP Policy**
  - ROOT Node = A
  - Leaf Node = D, E
  - Tree-ID = 1

- **Candidate path 1**
  - Preference = 1000
  - Instance-1
  - LSP ID = 1

- **Replication Policy A**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 1
  - Inc Rep SID

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = B
  - Sid-list B, C <C is bottom of Stack>

- **Replication Policy C**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 1
  - Inc Rep SID = C

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = D
  - Sid-list <D>

  - Next-hop-group-id 1
  - Next-hop-add = E
  - Sid-list <E>

- **Replication Policy D**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 1
  - Inc Rep SID

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = B
  - Sid-list B, C <C is bottom of Stack>

  - Next-hop-group-id 1
  - Next-hop-add = E
  - Sid-list <E>

- **Replication Policy E**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 1
  - Inc Rep SID = E

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = na

- **Candidate path 2**
  - Preference = 100
  - Instance-1
  - LSP ID = 3

- **Replication Policy A**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 3
  - Inc Rep SID

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = B
  - Sid-list B, C <C is bottom of Stack>

- **Replication Policy G**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 2
  - Inc Rep SID = G

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = D
  - Sid-list <D>

  - Next-hop-group-id 1
  - Next-hop-add = E
  - Sid-list <E>

- **Replication Policy D**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 1
  - Inc Rep SID

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = B
  - Sid-list B, C <C is bottom of Stack>

  - Next-hop-group-id 1
  - Next-hop-add = E
  - Sid-list <E>

- **Replication Policy E**
  - Tree-ID = 1
  - Root = A
  - Instance ID = 3
  - Inc Rep SID = E

  Forwarding Info
  - Next-hop-group-id 0
  - Next-hop-add = na
Next Steps

• Looking for adaptation in PIM WG