

P2MP Policy

draft-voyer-pim-sr-p2mp-policy

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PIM Working Group

Update

- Solid support for adaptation of draft-voyer-spring-sr-replication-segment-02 in last Spring WG meeting in Singapore.
- No adaptation email has been send by Spring Chairs yet. Long queues.
- Solid support for adaptation of draft-voyer-pim-sr-p2mp-policy on PIM WG.
- Multiple Vendors are in the mist of implementing this draft.

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;
 - Node-ID: The node this Replication Segment belongs too.
 - Instance-ID: Unique path-instance ID per <Root, Tree-ID>, it identifies a P2MP LSP.
 - **Replication-SID: Segment ID for this Replication Segment.**
 - **Replicaiton-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)

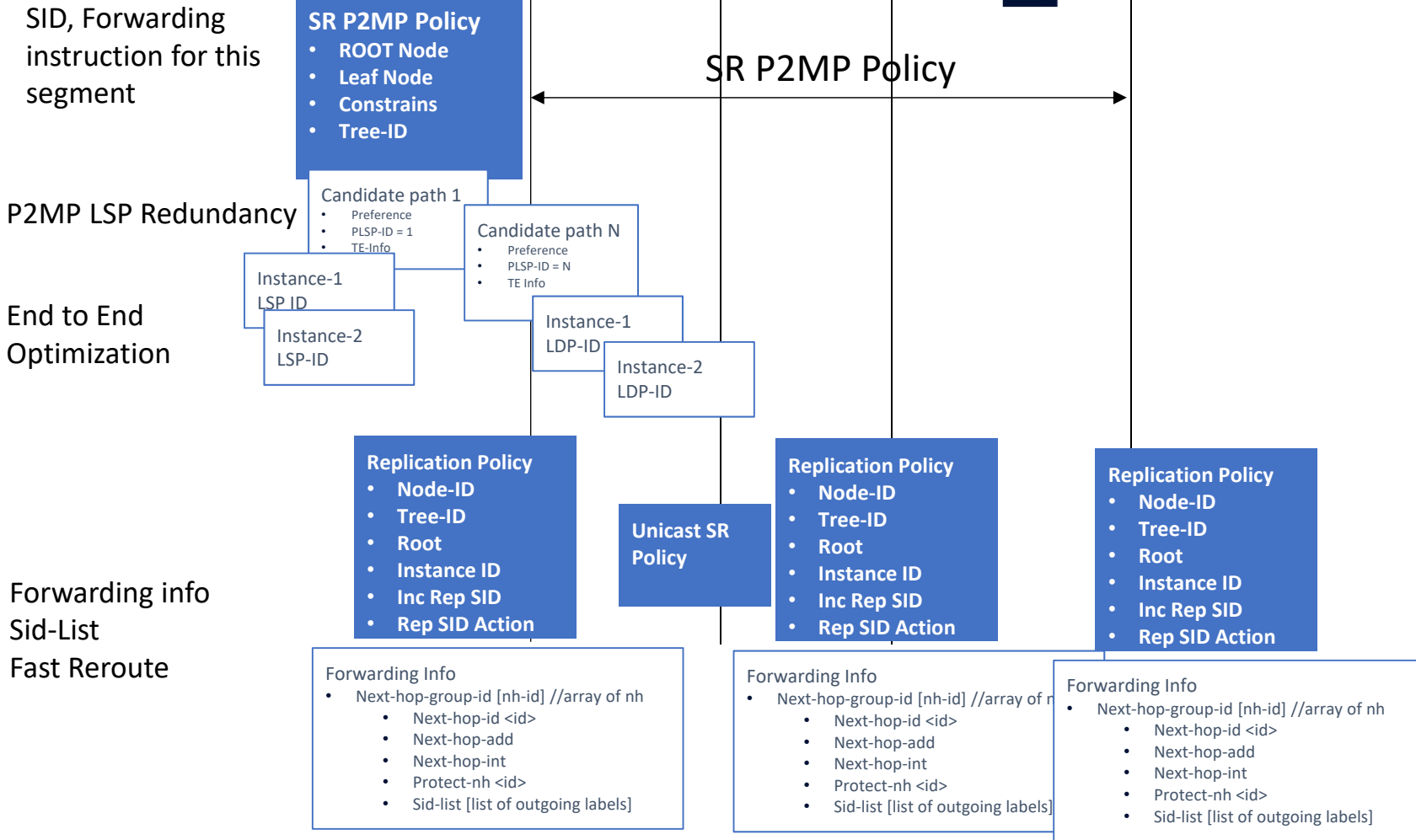
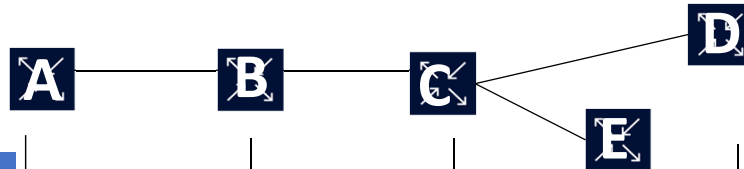
Shared Replication Segment

- Shared Replication segment is defined via following
 - Two or more P2MP trees May share a replication segment.
 - A tree has its own replication segment at its root.
 - Replication segment may be identified with Zero ROOT-ID, a unique Replication-ID (for the Tree-ID) and the Node-ID
 - As an example it can be used for Facility FRR when the by-pass tunnel is made of only Replication Segments to protect a nexthop. i.e. LFA or TI-LFA is not sued.



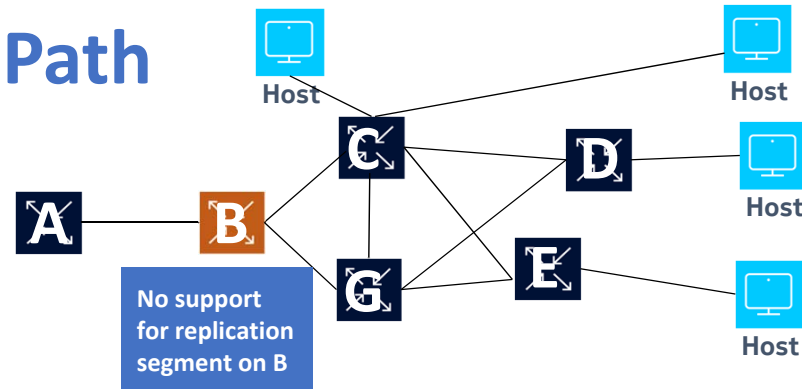
SR P2MP Objects

Non-SR-P2MP nodes



Example 1

Single Candidate Path



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

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 = D

Forwarding Info

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

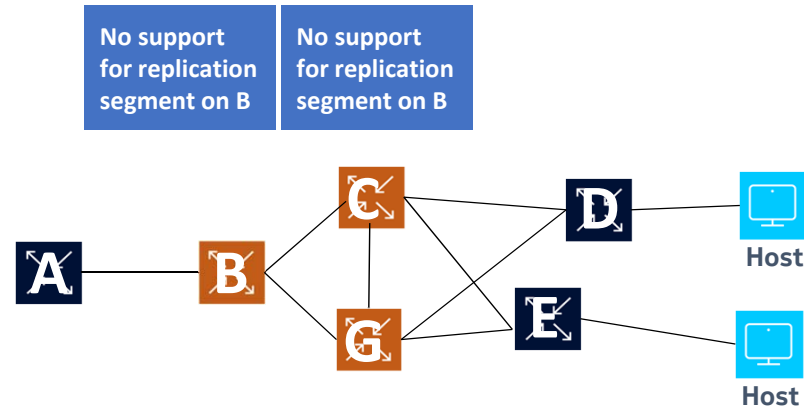
Replication Policy E

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

Forwarding Info

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

Example 2



1. Ingress Replication from A to D and A to E
2. Root and Leaves need to support Replication Policy.
3. B, C, G don't support P2MP Policy and are part of the unicast SR.
4. All SR resiliency functionality can be used in unicast SR domain.

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,D <D is bottom of Stack>
- Next-hop-group-id 1
 - Next-hop-add = B
 - Sid-list B,G,E <E is bottom of Stack>

Replication Policy D

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

Forwarding Info

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

Replication Policy E

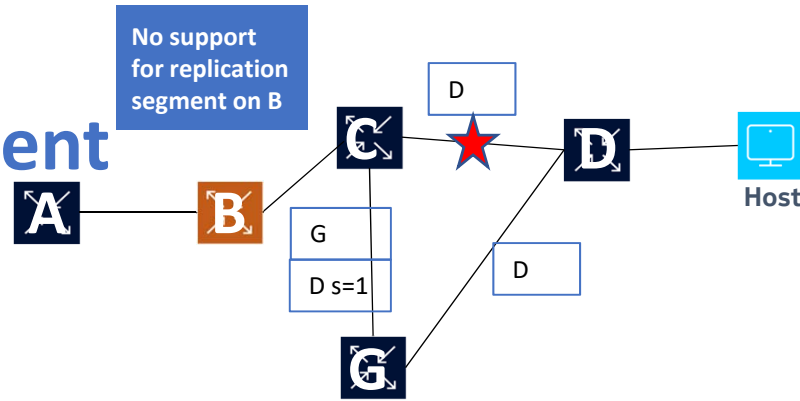
- Tree-ID =1
- Root = A
- Instance ID = 1
- Inc Rep SID = E

Forwarding Info

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

Example 3

FRR via Shared Replication Segment



1. The primary path is A to C to LEAF D
2. Link between C and D is cut, FRR Nexthop Protection via G
3. G can use a Shared RS to act as a facility bypass for multiple trees.
4. G Pops bypass label (Implicit Null and forwards D).

SR P2MP Policy

- ROOT Node=A
- Leaf Node=D,E
- Tree-ID=1

Replication Policy A

- Tree-ID =1
- Root = A
- Instance ID = 1
- Inc Rep SID

Replication Policy C

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

Replication Policy D

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

Replication Policy G

- Tree-ID = 100
- Root = 0
- Instance ID = 1
- Inc Rep SID = G

Forwarding Info

- Next-hop-group-id 0
 - Next-hop-add = D
 - Sid-list <D>
 - Prot NH
- Next-hop-group-id 1
 - Next-hop-add = G
 - Sid-list <G>

Forwarding Info

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

Forwarding Info

- Next-hop-group-id 0
 - Next-hop-add = D
 - Sid-list <impl-null>

Candidate path 1

- Preference = 1000

Instance-1

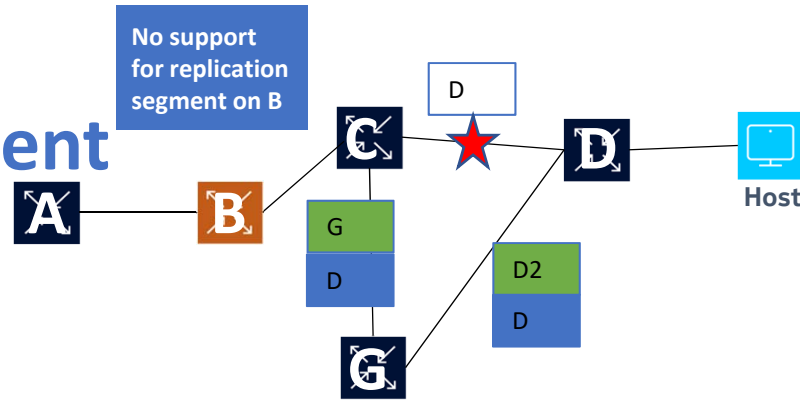
LSP ID = 1

Forwarding Info

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

Example 3

FRR via Shared Replication Segment



1. The primary path is A to C to LEAF D
2. Link between C and D is cut, FRR Nexthop Protection via G
3. G can use a Shared RS to act as a facility bypass for multiple trees.

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>
 - Prot NH 1
- Next-hop-group-id 1
 - Next-hop-add = G
 - Sid-list <G>

Replication Policy G

- Tree-ID = 100
- Root = 0
- Instance ID = 1
- Inc Rep SID = G

Forwarding Info

- Next-hop-group-id 0
 - Next-hop-add = D
 - Sid-list <D2>

Replication Policy D2

- Tree-ID =1
- Root = A
- Instance ID = 1
- Inc Rep SID = D2

Forwarding Info

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

Replication Policy D

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

Forwarding Info

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

Next Steps

- Looking for adaptation in PIM WG, prior to Spring WG, for obvious reasons.