

MVPN using BIER over P2M P

draft-xie-bier-mvpn-mpls-p2mp-00

IETF-100 Singapore

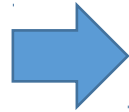
Jingrong Xie

default topology vs P2MP topology

R1 BIFT		
BFR-ID	F-BM	NBR
0001	0001	R1*
0010	0010	R2
0100	0100	R3
1000	1000	R4

R2 BIFT		
BFR-ID	F-BM	NBR
0001	0001	R1
0010	0010	R2*
0100	0100	R3
1000	1000	R4

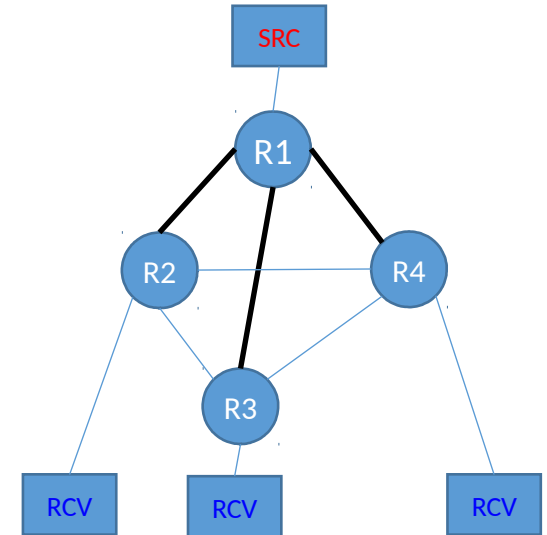
- BIER over default topology
- Redundancy, Loop



R1 BIFT		
BFR-ID	F-BM	NBR
0001	0001	Null
0010	0010	R2
0100	0100	R3
1000	1000	R4

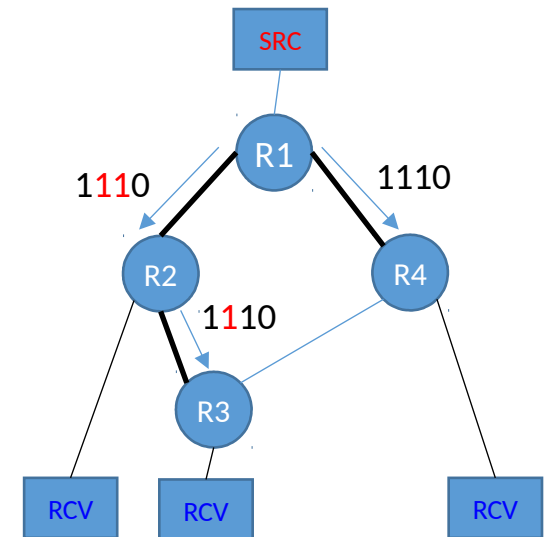
R2 BIFT		
BFR-ID	F-BM	NBR
0001	0001	Null
0010	0010	R2*
0100	0100	Null
1000	1000	Null

- BIER over P2MP topology
- Less Nbrs, No Loop



No Redundancy/Loop, and No ECMP/Entropy

- No redundancy/Loop
 - R4 has Link to R3, but R4 has no Nbr of R3
 - Not need to change BitString in packet
- No ECMP/Entropy
 - R1 has 2 ECMP paths to R3 in default topology, but in P2MP topology has only one.
 - Not need to use Entropy subfield for ECMP



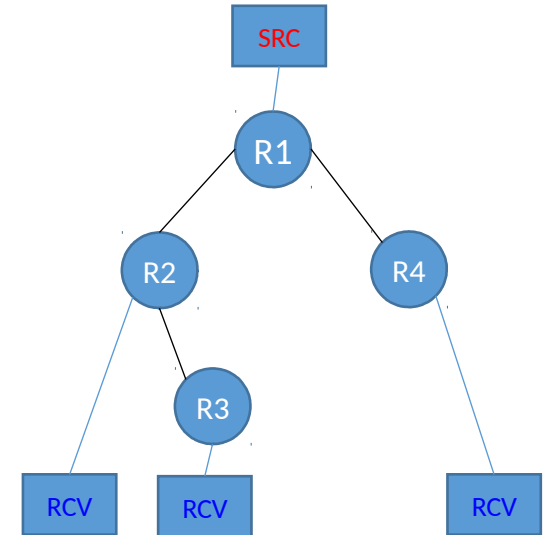
Optional forwarding based on P2MP

R1 FTN and NHLFE

FTN	(S,G, mcast-id)
NHLFE1	outInterface<toR2>, outLabel<byR2>, F-BM<0010>
NHLFE2	outInterface<toR4>, outLabel<byR4>, F-BM<1000>

R2 ILM and NHLFE

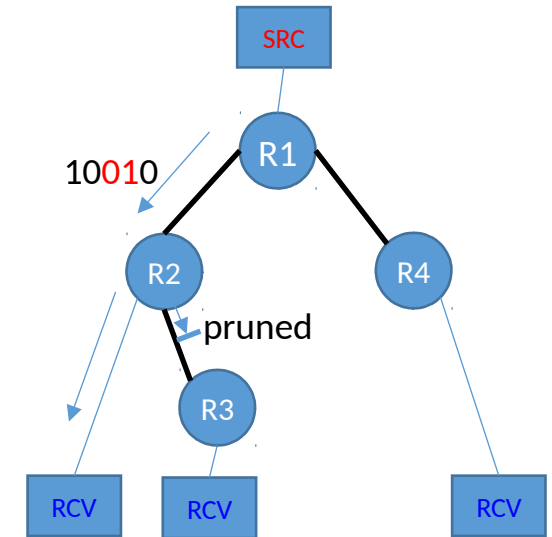
ILM	(inLabel<byR2>, mcast-id)
NHLFE1	outInterface<toR3>, outLabel<byR3>, F-BM<0100>
NHLFE2	outInterface<loopback>, outLabel<null>, F-BM<0010>



- When R1 forwarding a packet with BS<1010>, it just TRY to forward to every NHLFE, if the NHLFE F-BM AND'ing the BS<1010> is not zero, then forward, otherwise prune.
- When R2 forwarding a packet with BS<1010>, it just TRY to forward to every NHLFE, if the NHLFE F-BM AND'ing the BS<1010> is not zero, then forward, otherwise prune.

Evolution from MVPN P2MP to MVPN BIER P2MP

- **MVPN P2MP:**
 - Can use a widely-involved I-PMSI P2MP tunnel to carry 1*VPN's $N^*(S,G)$ flows
 - Can use a more widely-involved aggregated I-PMSI tunnel to carry M^* VPN's $N^*(S,G)$ flows
 - To save more 'states', as a trade-off, to waste more bandwidth.
 - **Because pruning is only carried out at the bottommost PE.**
- **MVPN BIER P2MP:**
 - Can use a Per-vpn I-PMSI P2MP, as BIER underlay topology.
 - Can also use an Aggregated I-PMSI P2MP, as BIER underlay topology.
 - **Pruning is carried out at every node, from topmost.**
- **Only Minor changes from MVPN P2MP:**
 - Add a F-BM on P2MP NHLFE.
 - Stack a BIER-header on Packet.
 - When replicating to P2MP NHLFEs, do pruning by AND'ing Packet BitString and NHLFE F-BM.



Evolution from MVPN P2MP to MVPN BIER P2MP(RSVP-TE)

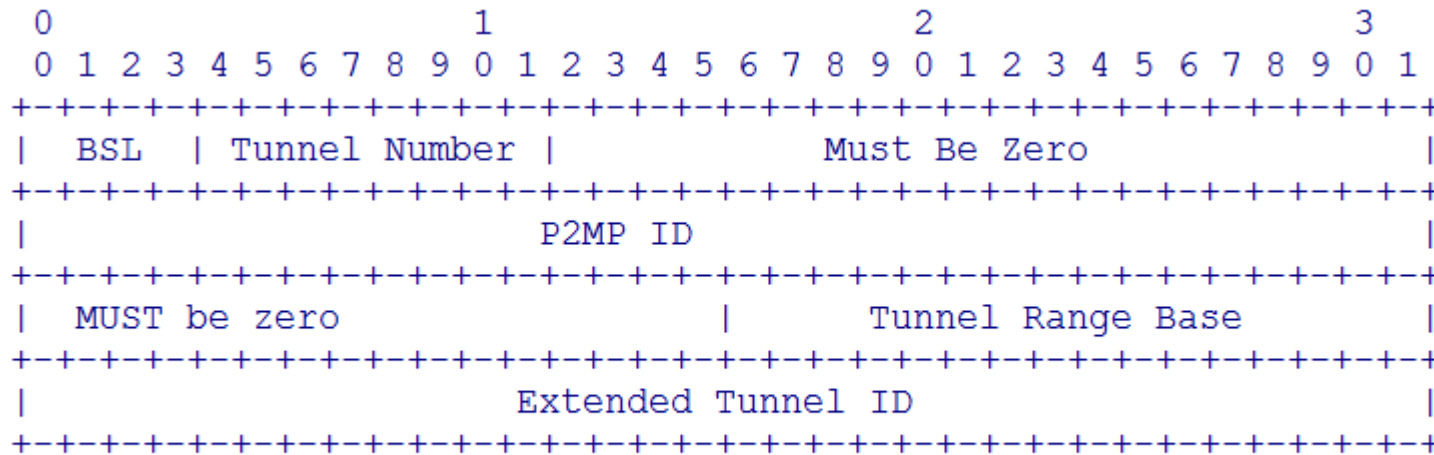
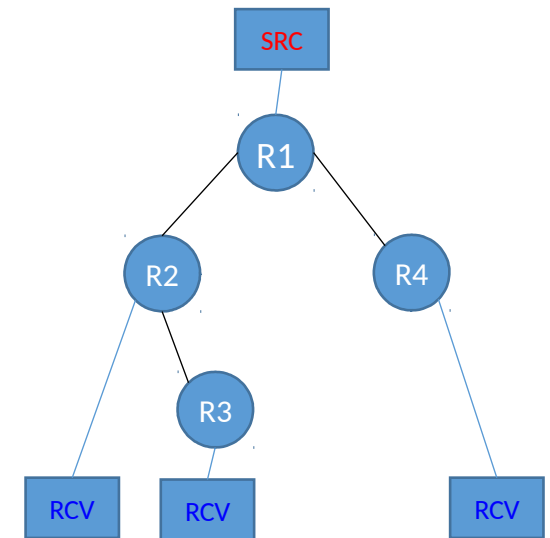


Figure 1: PTA of RSVP-TE P2MP LSP based BIER



- Only One fixed BSL used.
- A batch of 'RSVP-TE P2MP' tunnels identified by (Tunnel Number, Tunnel Range Base)
 - R1...Rn join 'RSVP-TE P2MP' tunnel identified by <P2MP ID, Tunnel Range Base, Ext Tunnel ID>
 - Rn+1...Rn+m join 'RSVP-TE P2MP' tunnel identified by <P2MP ID, Tunnel Range Base + 1, Ext Tunnel ID>
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Evolution from MVPN P2MP to MVPN BIER P2MP (mLDP)

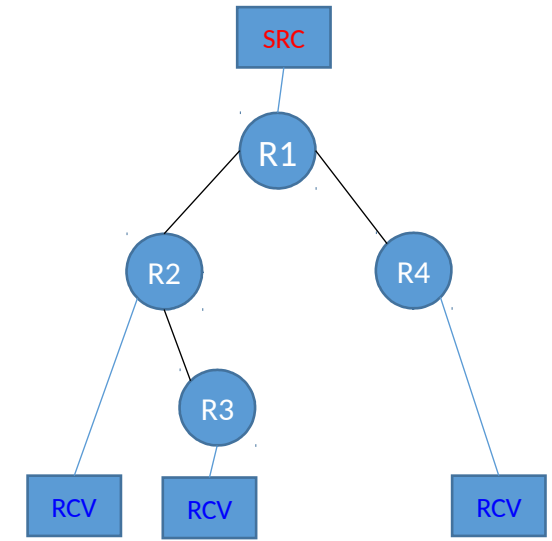
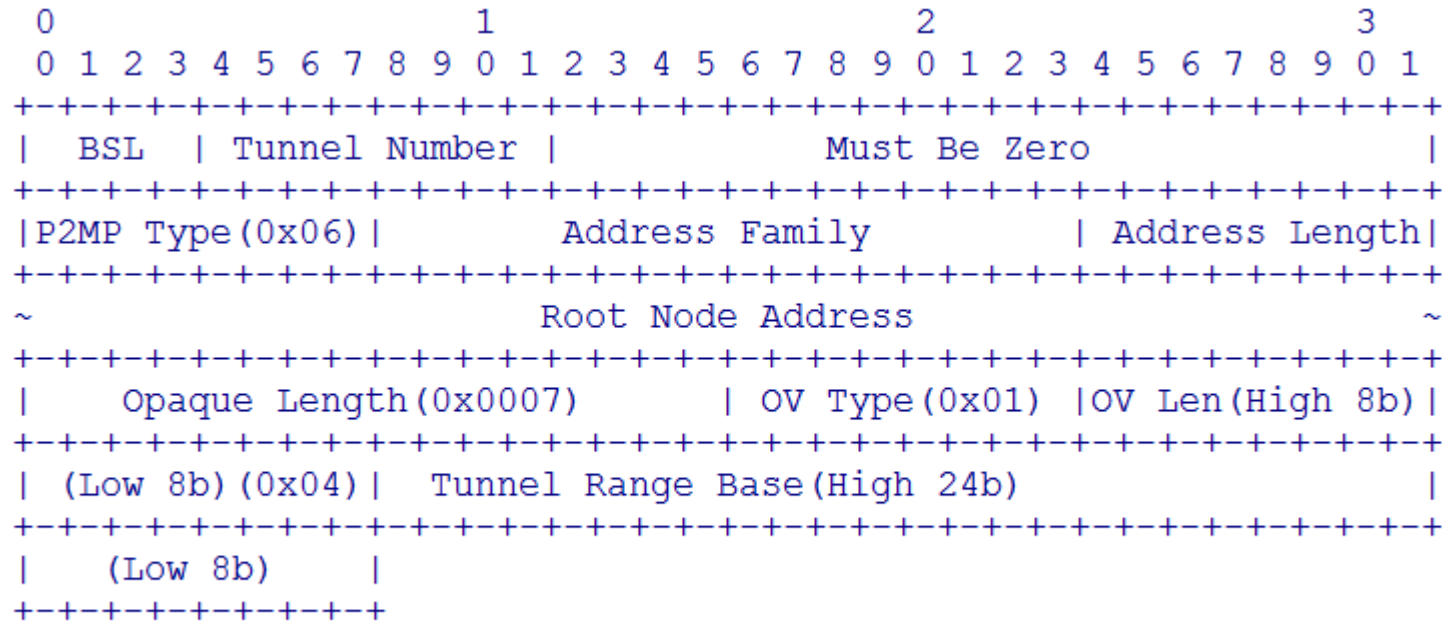
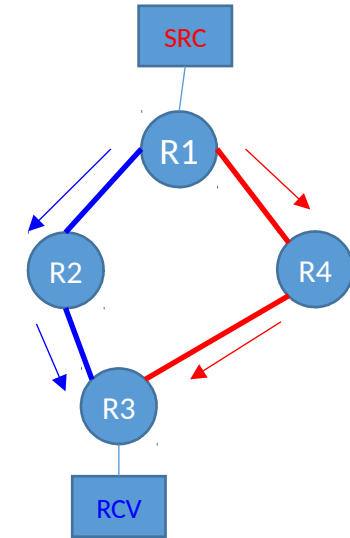
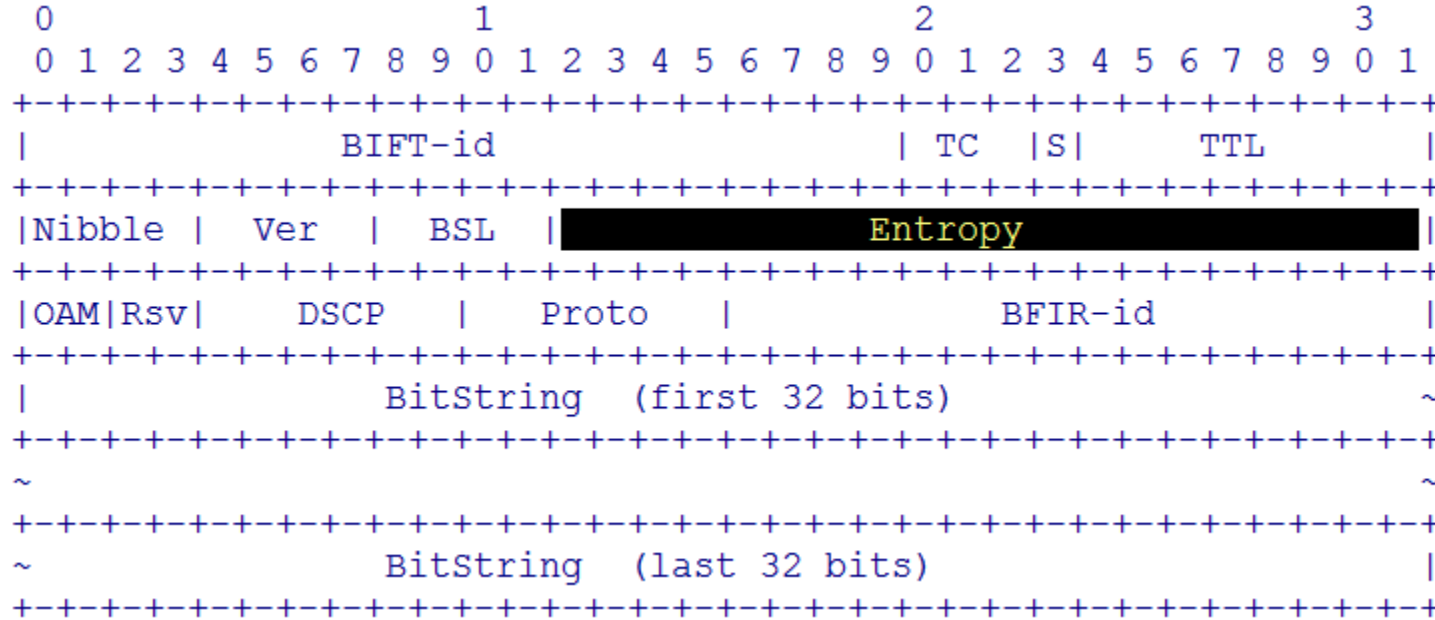


Figure 2: PTA of mLDP P2MP LSP based BIER

- Only One fixed BSL used.
- A batch of 'mLDP P2MP' tunnels identified by (Tunnel Number, Tunnel Range Base)
 - R1...Rn join 'mLDP P2MP' tunnel identified by FEC<Root Node Address, Tunnel Range Base>
 - Rn+1...Rn+m join 'mLDP P2MP' tunnel identified by FEC<Root Node Address, Tunnel Range Base + 1>
 -

Optional Use Entropy as sequence-numberer



- Use Entropy as sequence-number.
- **Ingress PE (R1):** when forwarding packet from SRC to R2/R4, it imposes a sequence-number in the Entropy subfield, per-flow per-packet.
- **Transit PE (R2/R4):** not need to care about Entropy.
- **Egress PE(R3):** when forwarding packet to local receiver, it brings the sequence-number out, check with the following IP-header(S,G), on a per-flow basis.

Next Step

- mLDP extension for BIER
- RSVP-TE extension for BIER

- Questions and Comments
- Welcome more vendors and carriers involved