Simplified MVPN for BIER and IR

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RFCC6037: firstly proposed MVPN; PIM was the only protocol to build PMSI tunnels

RFC6513, 6514: RSVP-TE, mLDP and Ingress Replication tunnel for MVPN

- Inclusive PMSI: ANY PE attaching to a particular MVPN can transmit and receive message
- Selective PMSI: A subset of PE attaching to a particular MVPN can receive

To trade off between Optimality and Scalability, both inclusive and selective multicast are supported

Seven MCAST-VPN NLRIs involved to establish multicast forwarding tree

RFC8534: Explicit Tracking in MVPN

RFC8556: BIER as one tunnel type to optimize multicast forwarding
Selective Multicast in P2MP Tunnel

Instantiate inclusive-PMSI is a common first step to establish MDT over provider network.

When traffic exceeds preset threshold, switching from I to S PMSI is inevitable for mLDP or RSVP-TE.
Problems

Selective multicast is necessary for P2MP tunnel for saving bandwidth

But for BIER and IR, complicated NLRI exchange and switching from I- to S-PMSI tunnel are not necessary

Ingress PE:

- Follows traditional process of establishing multicast tunnel
- Maintain and check whether multicast flow at any time so to switching from I- to S-PMSI
- Very complicated exchange of control-plane and data-plane

Service provider backbone:

- Three types of NLRIs involved in process of customer’s routes advertisement
- Four types of NLRIs are leveraged to collect tunnel informations
Solution

Constructing S-PMSI tunnel directly:
- Current MVPN architecture and NLRI exchanges are too heavy
- Architectural advantages of BIER and IR: intrinsically support explicit tracking at ingress PE
- Each leaf PE is unique
  --------> No inclusive PMSI tunnel

Segment routing is widely discussed, implemented and regarded as a simplification of MPLS

Simplify type 1-4 NLRIs with:

\[
\begin{array}{l}
\text{New MVPN Eligible UMH Route} \\
| \text{MS-ID} (4 \text{ or } 16 \text{ octets}) \\
| \text{Sub-domain ID} (2 \text{ octets}) \\
| \text{BFR-ID} (2 \text{ octets}) \\
\end{array}
\]

Simplify type 6-7 NLRIs with:

\[
\begin{array}{l}
\text{New Per-Leaf C-multicast(S/*,G) Route} \\
| \text{RD} (8 \text{ octets}) \\
| \text{Source Address} (4 \text{ or } 16 \text{ octets, } 0 \text{ to } 32 / 128) \\
| \text{Group Address} (4 \text{ or } 16 \text{ octets, } 0 \text{ to } 32 / 128) \\
| \text{Flag} (1 \text{ octet}) \\
| \text{Originating Router's IP Addr} (4 \text{ or } 16 \text{ octets}) \\
| \text{Sub-domain ID} (2 \text{ octets}) \\
| \text{BFR-ID} (2 \text{ octets}) \\
\end{array}
\]
Solution – NLRI Exchange

- Always selective multicast forwarding
- No IPMSI to SPMSI switching
- No more NLRI Type-1/2/3 route
- No need to separate C-multicast and Leaf-AD
- Always explicit tracking
- Merge NLRI Type-4/6/7 route as (S,G,R,L)
- No more NLRI Type-5 route

S/RP UMH route:
1. BIER/IR PTA, MSID
   VRF Import RT, Source AS

Per-Leaf C-multicast(S/*,G) route (new):
2. RD+S/*+G+Root+Leaf

Peers

1. Source
   BFR-id = x
   PE1
   (S,G1)

2. P1
3. P2
4. PE2
5. PE3
6. Receiver
   BFR-id = z
   BFR-id = y
   CE2
   CE3
   (S,G1)
   (S,G2)
Next Steps

• BESS WG reviews and comments

• Optimize solutions
Thanks