Segment-based EVPN (S-EVPN)

draft-li-l2vpn-segment-evpn-01

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About This Draft

- Describe pain points in PBB-EVPN/EVPN implementation and operation

- Propose an enhanced EVPN solution in Central Control Environment: S-EVPN

  - It satisfies the PBB-EVPN requirements w/o PBB implementation on PE

  - It uses EVPN protocol and IP/MPLS only

S-EVPN Solution

- Comparing with PBB-EVPN:
  - PBB-EVPN: Use B-MAC to represent the source of C-MAC
  - S-EVPN: Use global label for Ethernet Segment to represent the source of C-MAC
- New solution based on central control environment: RR is used to assign the ES global labels for Ethernet Segment.
- Change from EVPN: Use Ethernet Segment to every CE including single-homed CE
- Enhancement for EVPN: ES global label can be used as the substitute for ES-label to implement split horizon functionality.

```
                          +---------------+
                          |   IP/MPLS     |
                          |   Network     |
     +----+ ES1 +----+    |               |  +----+ ES2 +----+
     | CE1|-----|    | |  |               |  |    |-----| CE2|
     +----+\    | PE1|\|     +---- +      |/| PE3|     +----+
         \    +----+ \____|      |     / +----+
          \               | RR+ |___/|
     ES1\ +----+ /----|        |      |
         \|     |/|     +-----+      |
          | PE2| |                   |
          +----+ |                   |
                 +---------------+
```

S-EVPN Solution Highlight

- Remove the requirement of automating B-MAC address assignment to simplify provision of PBB-EVPN.

- Improve the payload efficiency comparing with PBB-EVPN.

```
+-------------+-------------+----------------------+-------------+
| Tunnel Label |  EVI Label  | Source ES Global Label |   Payload   |
+-------------+-------------+----------------------+-------------+
                 Packet Format in S-EVPN
```

compared to PBB-EVPN:

```
+-----+-----+------+------+------+-----+------+-------+-----------+
|Tunel| MAC |      |      |Ether |     |Ether |       |           |
|Label|Label| B-DA | B-SA |Type  |B-VID|Type  | I-Tag | Payload   |
|     |     |      |      |0x88A8|     |0x88E7|       |           |
+-----+-----+------+------+------+-----+------+-------+-----------+

              Packet Format in PBB-EVPN
```

- Seamless MPLS thoughts to solve the issue dealt with by PBB-EVPN instead of combination of two distinct technologies.

- Unify EVPN split horizon function for Ingress replication, P2MP and MP2MP.

- Be able to unify unicast traffic forwarding of E-VPN to implement seamless switch between C-MACs learning through control plane and C-MACs learning through data plane.

Updates

- Add reference to [I-D.li-mpls-global-label-framework].
  - Global Label can be useful for many use cases: in EVPN overlay for VXLAN, global VN ID can be seen as the variant of global label.
  - Central Control is a natural architecture for global label allocation.
  - RR plays a key role in EVPN: it can greatly reduce the operation cost comparing with possible full mesh peer configuration in VPLS.
  - RR can co-exist with PCE to play more important roles in EVPN for better service provisioning: RR for Ethernet service optimization and PCE for transport tunnel optimization.
  - S-EVPN is just to utilize the new technology development trend to solve the traditional issues better.
- Add reference to the multicast optimization requirements to use MP2MP LSPs in EVPN ([I-D.ietf-l2vpn-evpn-req]).
- Correct text errors.

Regarding Comments

- Possible issue for Global Label in inter-domain scenarios:
  - Lack of Inter-AS process description in existing EVPN solution.
  - Possible ways for Global Label in inter-domain scenarios are in research.
    - Global label allocation spanning multiple domains.
    - Swap global label at the edge of the domain (Domain-wide label).
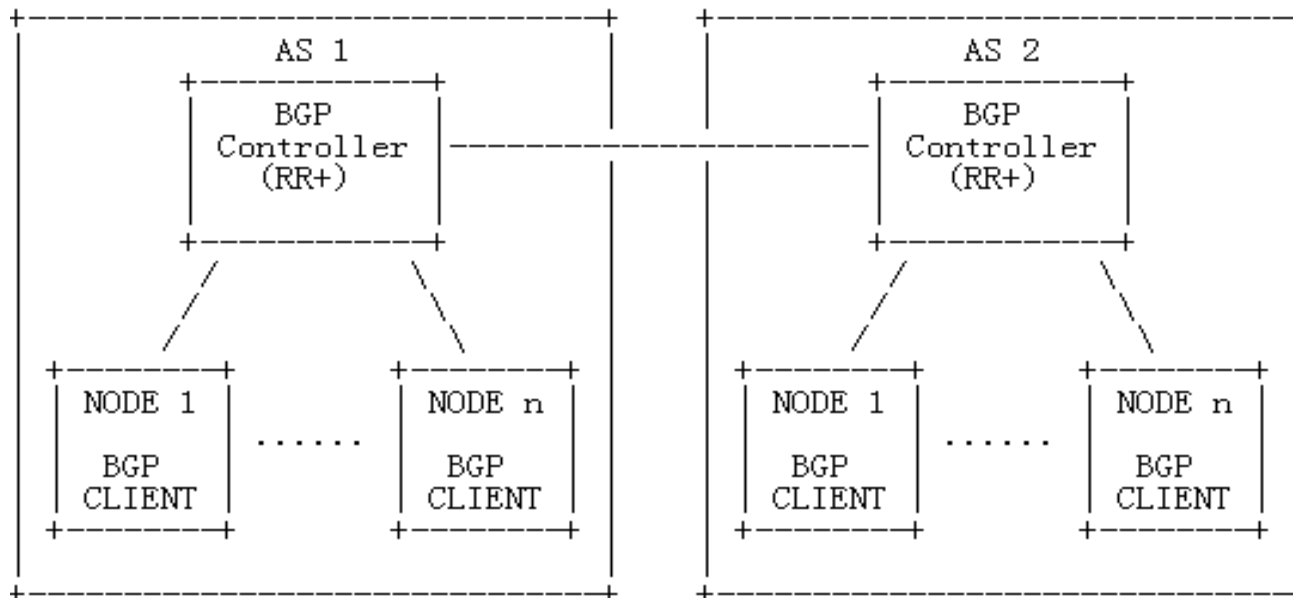

Figure 1: An Architecture of Central Controlled BGP

Regarding Changes on EVPN

- Unique Ethernet Segment Identifier including single-homed ES
  - It is possibly future-proof with thin granularity. Using 0 for single-homed ES identifier may not distinguish service well.
  - The cost is not high to distinguish single-home and multi-home when Unique ESI is used.

- ES Global Label for split horizon in EVPN
  - [I-D.ietf-l2vpn-evpn-req] specifies the multicast optimization requirements to use MP2MP LSPs in EVPN.
  - It is a practical requirement to use MP2MP tunnel to bear multicast service. In some scenarios, it can reduce the number of P2MP trees to gain scalability advantage over P2MP.
  - S-EVPN is a possible way to implement split horizon for MP2MP.

Next Step

- Seek comments and feedbacks
- Request to be adopted by WG