A Framework of MPLS Global Label
draft-li-mpls-global-label-framework-01

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History and Purpose of Presentation

- History
  - Propose drafts before IETF 87.
  - Intense presentation in IETF 88: three drafts in 15 minutes in SRING WG.
- Purpose of Presentation
  - Return to MPLS WG to discuss MPLS global label.
  - Solicit more comments.

Usecases of MPLS Global Label

- Identification of Location:
  - VPLS Multicast over MP2MP LSP: Be used to represent source PE for learned MAC address.
  - Segment-Based EVPN: Be used to represent source Ethernet Segment for C-MACs.
  - MPLS OAM for LDP LSP: Be used to represent source PE for LDP LSP.
- Identification of Service:
  - Aggregating MVPNs over single P-Tunnel: Be used to represent MVPN.
  - Local Protection of PE Node: Be used to represent L3VPN/L2VPN.
  - Service Chain: Be used to represent service flow.
- Identification of Network:
  - Segment Routing: Be used to represent network nodes.
  - MPLS Network Virtualization: Be used to represent virtual network topology, virtual network nodes and virtual network links.
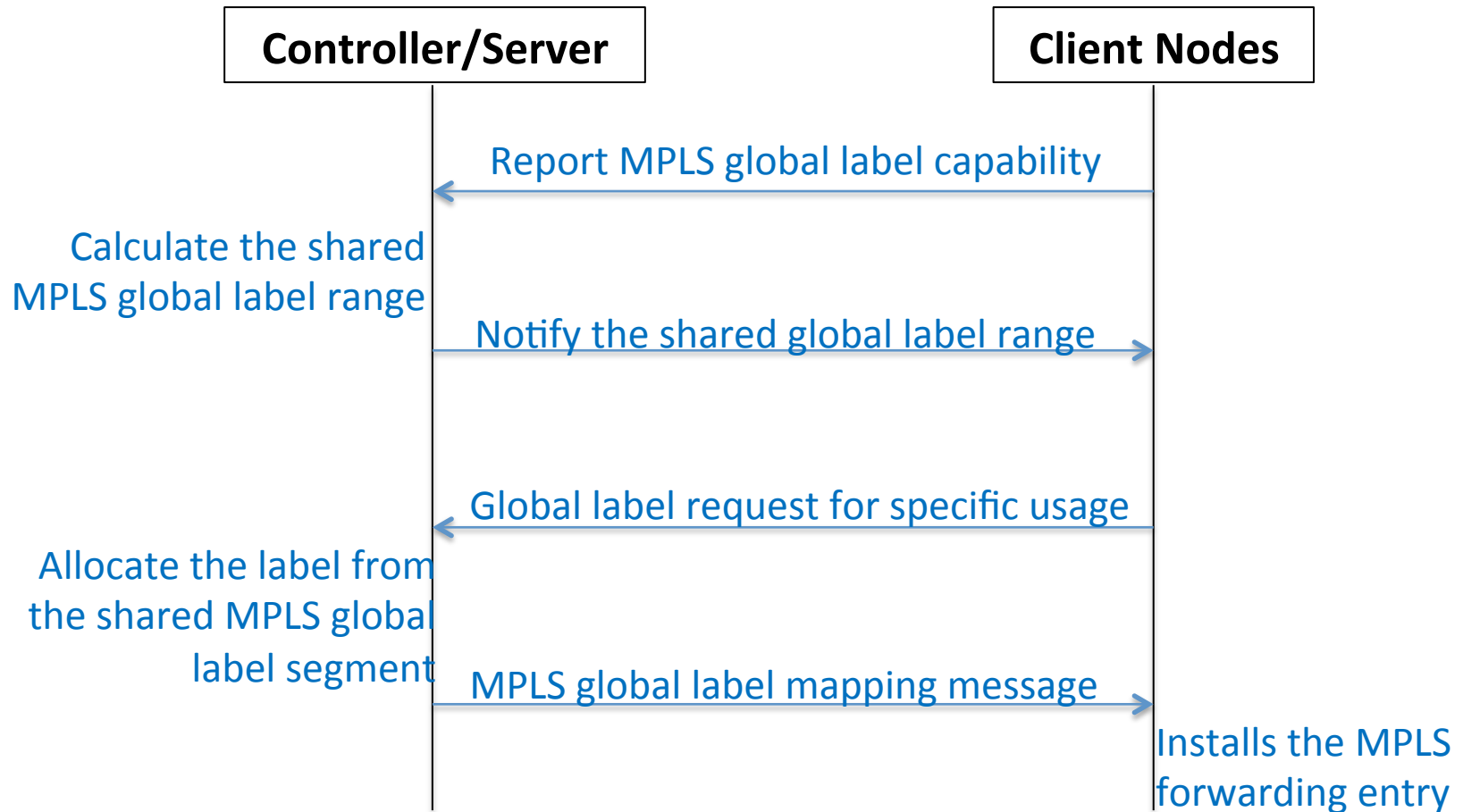
Thinking on MPLS Global Label

- Usage of MPLS Global Label
  - Cope with traditional challenges with higher efficiency: e.g. C-MAC learning.
  - New application scenarios: segment routing, service chain, etc.
- Choice of Architecture for MPLS Global Label
  - Central Control should be adopted to coordinate label allocation for all nodes.
  - Existing Central Control Point (DR/RR/PCE) can be reused and enhanced.
- Choice of Protocol Extensions for MPLS Global Label based on Different Applications:
  - IGP-based: Be suitable for applications which needs to advertise label binding to all network nodes.
  - BGP-based: Be suitable for applications which needs to advertise label binding to edge network nodes.
  - PCE-based: Be suitable for LSP-specific which needs to advertise label binding to part of network nodes.
  - Inter-domain Applications: BGP-based or PCE-based.

Representation of MPLS Global Label

- Option A: Use the traditional MPLS label range (16 ~ 2^20 -1). A shared label segment can be calculated for all nodes to reserve for the usage of MPLS global label.

  - Pros: Keep the same with the mechanism with the existing label mechanism.

  - Cons: There might be confliction between the global label and the existing label range.

- Option B: Expand MPLS label range with label stack mechanisms to resolve the possible confliction between the global and the existing label range.

Control Plane

- MPLS global label should be allocated through a centralized controller to guarantee all nodes can have the same interpretation for a specific global label. It should adopt a central controlled architecture for MPLS global label allocation.

| Controller/Server | Client Nodes |

Report MPLS global label capability

Calculate the shared MPLS global label range

Notify the shared global label range

Global label request for specific usage

Allocate the label from the shared MPLS global label segment

MPLS global label mapping message

Installs the MPLS forwarding entry

Control plane (Cont.)

- BGP-Based Control Plane:
  - Route Reflector (RR) can act as the role of BGP controller. We call this type of RR as RR+.
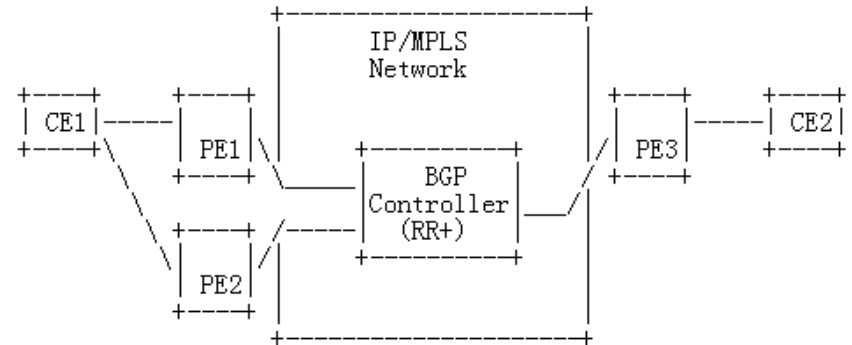
- IGP-Based Control Plane
  - Similar mechanism as DR can be used for IGP controller.

- PCE-Based Control Plane
  - The PCE servers can act as the role of the centralized controller and the PCC can act the role of the client for process of MPLS global label.

```
                        +---------------------+
                        |     IP/MPLS         |
                        |     Network         |
+----+      +----+      |                     |    +----+     +----+
| CE1|------|    |      |    +----------+     |    |    |-----| CE2|
+----+    \ |PE1|\      |    |   BGP    |    /|    |PE3|     +----+
          \ +----+ \    |    |Controller|   / +----+
           \      \ |   |    |  (RR+)   |  /
            \      +----+    |          | /
             \     |PE2|/    |          |/
              \    +----+    +----------+
               \                        |
                +-----------------------+
```
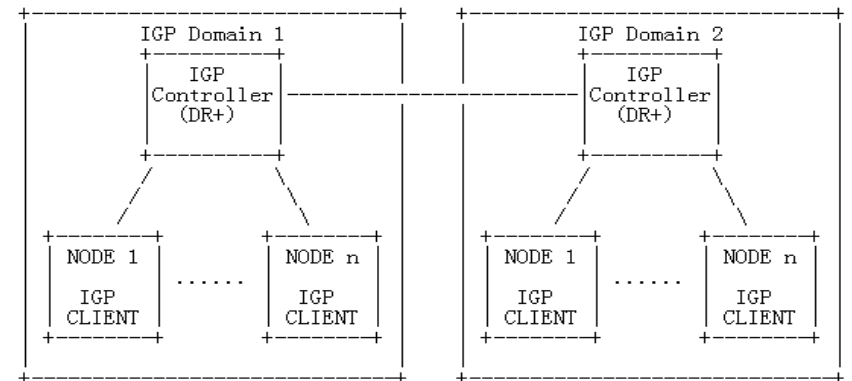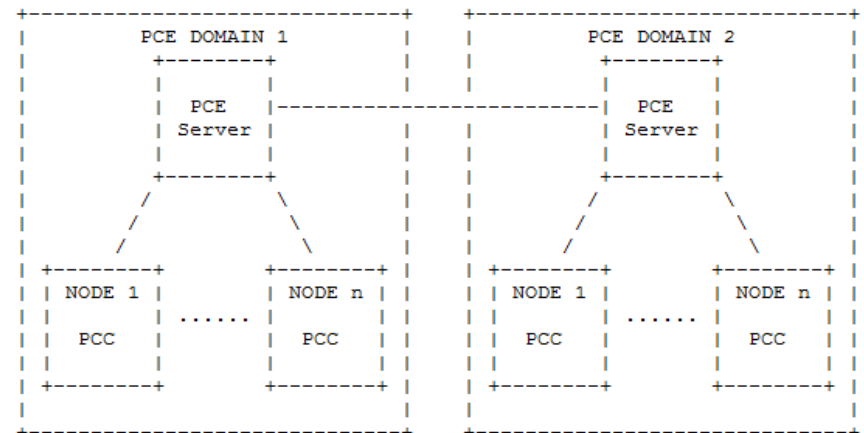
```
+---------------------+  +---------------------+
|    IGP Domain 1     |  |    IGP Domain 2     |
|    +---------+      |  |    +---------+      |
|    |   IGP   |------|--|----|   IGP   |      |
|    |Controller|     |  |    |Controller|     |
|    |  (DR+)  |      |  |    |  (DR+)  |      |
|    +---------+      |  |    +---------+      |
|      / \            |  |      / \            |
|     /   \           |  |     /   \           |
| +-------+  +-------+ |  | +-------+  +-------+ |
| |NODE 1 |  |NODE n | |  | |NODE 1 |  |NODE n | |
| |       |..|       | |  | |       |..|       | |
| |  IGP  |  |  IGP  | |  | |  IGP  |  |  IGP  | |
| |CLIENT |  |CLIENT | |  | |CLIENT |  |CLIENT | |
| +-------+  +-------+ |  | +-------+  +-------+ |
+---------------------+  +---------------------+
```

```
+-----------------------+  +-----------------------+
|    PCE DOMAIN 1       |  |    PCE DOMAIN 2       |
|    +--------+         |  |    +--------+         |
|    |  PCE   |---------|--|----|  PCE   |         |
|    | Server |         |  |    | Server |         |
|    +--------+         |  |    +--------+         |
|      /    \           |  |      /    \           |
|     /      \          |  |     /      \          |
| +--------+ +--------+ |  | +--------+ +--------+ |
| | NODE 1 | | NODE n | |  | | NODE 1 | | NODE n | |
| |        |.|        | |  | |        |.|        | |
| |  PCC   | |  PCC   | |  | |  PCC   | |  PCC   | |
| +--------+ +--------+ |  | +--------+ +--------+ |
+-----------------------+  +-----------------------+
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Updates

- Incorporate using existing MPLS label range for MPLS Global Label in Representation of MPLS Global Label.

- Remove related sections which refer to [I-D.li-mpls-mega-label] since expansion of MPLS label range needs more work.

- Use general term "controller" in the architecture.

- Correct text errors.

Next Steps

- Solicit more comments and feedbacks.

- More global label operations are taken into account: Label Withdraw, Error Process, Inter-domain, etc.

- Revise the draft.