PCEP Procedures and Extension for VLAN-based Traffic Forwarding

[**draft-wang-pce-vlan-based-traffic-forwarding**]

*Yue Wang (China Telecom)*

*Aijun Wang (China Telecom)*

IETF 112, Nov. 2021

Motivation

- RFC8821 describes an architecture for providing traffic engineering in a native IP network by using multiple BGP sessions and a PCE-based central control mechanism.

- RFC9050 specifies the procedures and PCEP extensions for PCECC to derive MPLS Label Switched Paths.

- With the large scale deployment of Ethernet interface, it is possible to use the info contained in the Layer2 frame to simplify the E2E packet forwarding procedure.

- Based on the mechanism mentioned in RFC9050 and RFC8821, this document defines PCEP extension for VLAN-based traffic forwarding in native IP network and describes the processes of the data packet forwarding system based on VLAN info.

Procedures for VLAN-based Traffic Forwarding
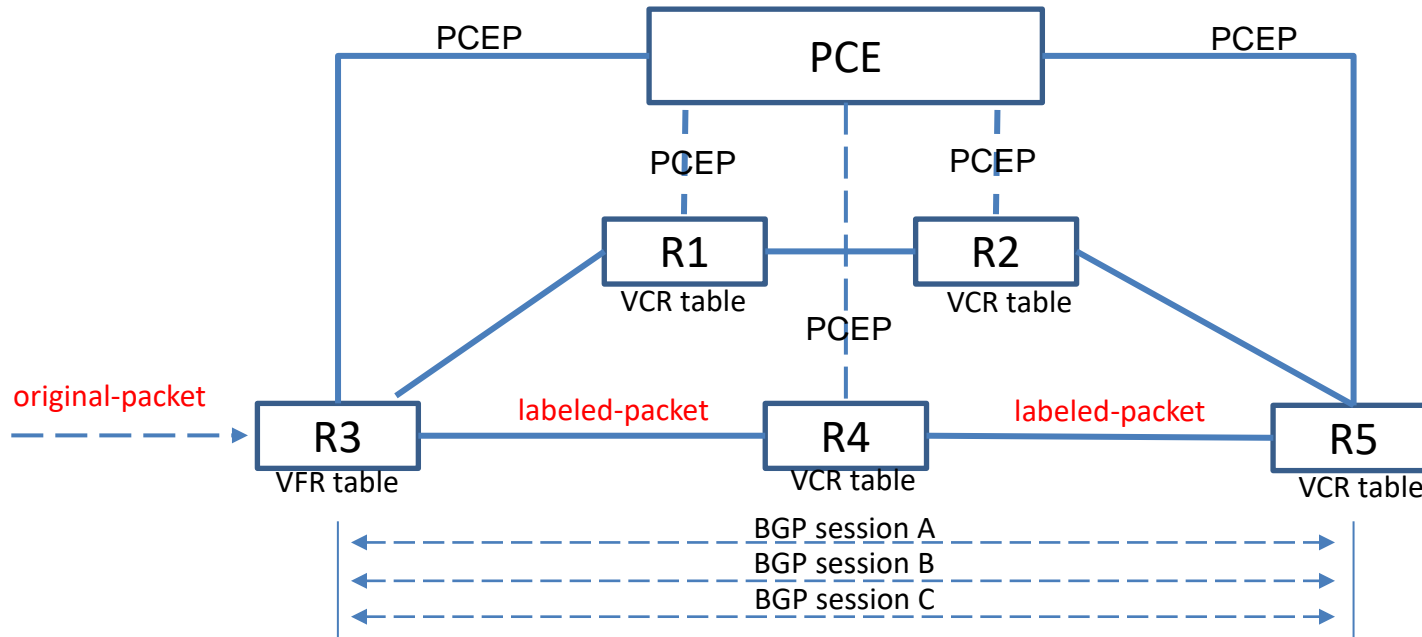
1. The PCE calculates the explict route and sends the route information to the PCCs through PCInitiate messages.
2. The ingress PCC forms a VLAN-Forwarding routing(VFR) table, the transit PCC and the egress PCC forms a VLAN-Crossing routing(VCR) table.
3. The packet to be guaranteed matches the table and then be labeled with corresponding VLAN tag.
4. The labeled packet will be further sent to the PCC's specific subinterface identified by the VLAN tag and then be forwarded.

3

Data Packet Encapsulation Process
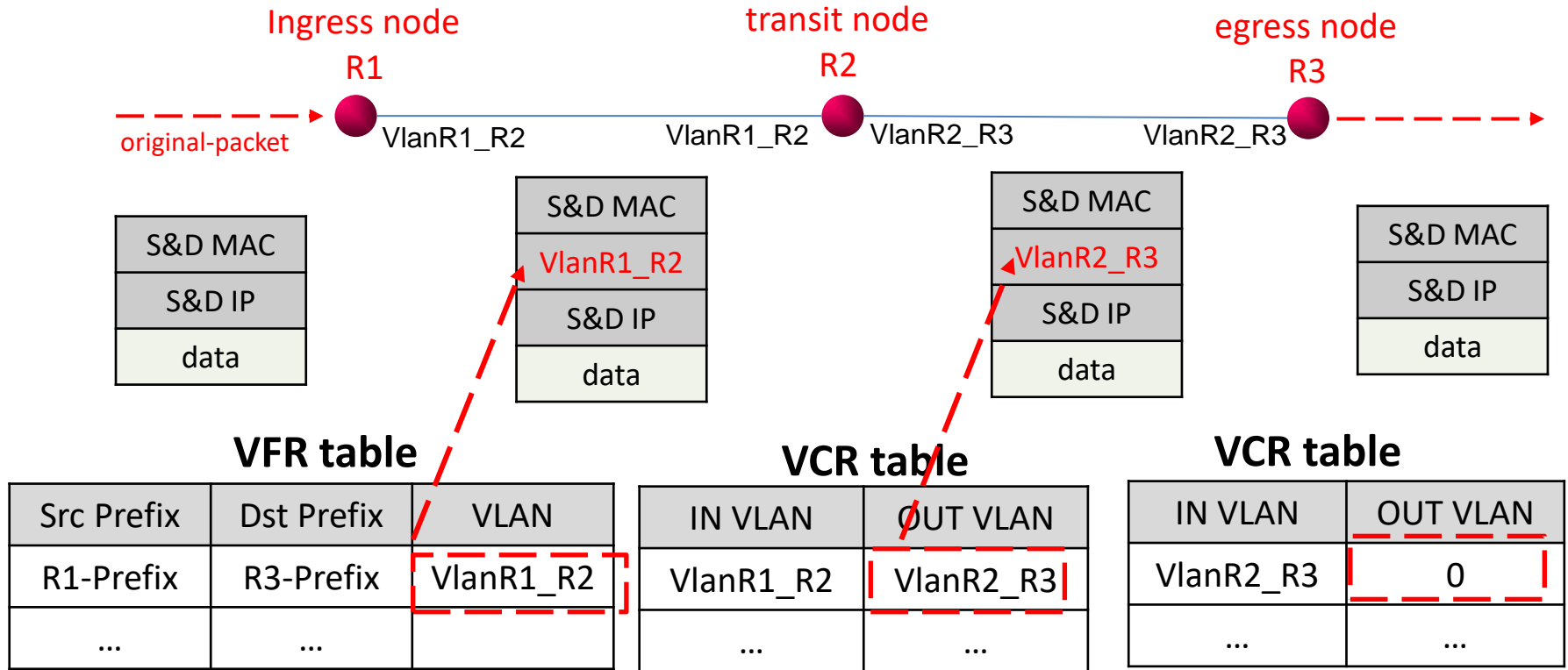
- This mechanism uses a completely new address space and is suitable for ipv4 and ipv6 networks and can leverage the existing PCE technologies as much as possible.

Updated Contents
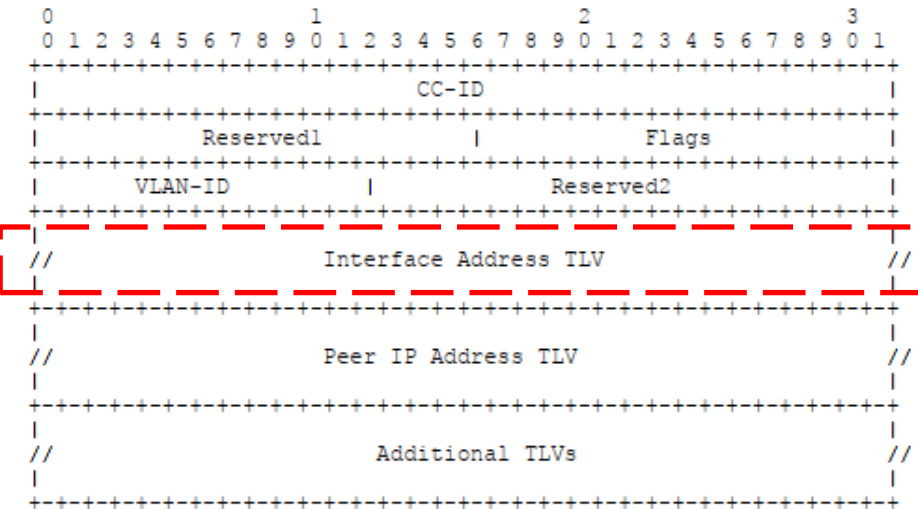
Figure 5: VLAN Forwarding CCI Object

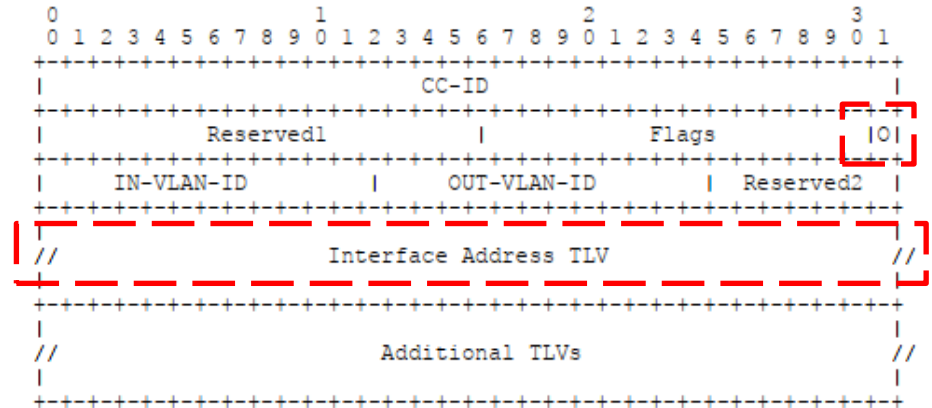Figure 6: VLAN Crossing CCI Object

- Interface Address TLV is included to specify the interface which will set up the vlan defined in the VLAN Forwarding CCI Object.

- Flags - O bit (out-label) : If the bit is set to '1', it specifies the VLAN is the out-VLAN, and it is mandatory to encode the egress interface information. If the bit is not set or set to '0', it specifies the VLAN is the in-VLAN.

Updated Contents

Table 1: Message Information

```
+----------------------------------------------------------------------+
| No.| Peers|     Type    |        Message Key Parameters              |
+----------------------------------------------------------------------+
|M1   |PCE/R1|PCInitiate|CC-ID=X1                                       |
|M1-R|       |PCRpt      |VLAN Forwarding CCI Object                     |
|     |       |           |(Peer_IP=R6_A, Interface_Address=INF1,        |
|     |       |           |VLAN_ID=VLAN_R1_R2)                           |
+----------------------------------------------------------------------+
```

Table 2: Message Information

```
+--------------------------------------------------------------------------+
| No.| Peers|   Type    |           Message Key Parameters                 |
+--------------------------------------------------------------------------+
|M1   |PCE/R2|PCInitiate|CC-ID=X1                                           |
|M1-R|       |PCRpt      |VLAN crossing CCI Object(IN)                       |
|     |       |           |(O=0,Interface_Address=INF1,IN_VLAN_ID=VLAN_R1_R2) |
|     |       |           |VLAN crossing CCI Object(OUT)                      |
|     |       |           |(O=1,Interface_Address=INF2,OUT_VLAN_ID=VLAN_R2_R3)|
+--------------------------------------------------------------------------+
|M2   |PCE/R3|PCInitiate|CC-ID=X1                                           |
|M2-R|       |PCRpt      |VLAN crossing CCI Object(IN)                       |
|     |       |           |(O=0,Interface_Address=INF1,IN_VLAN_ID=VLAN_R2_R3) |
|     |       |           |VLAN crossing CCI Object(OUT)                      |
|     |       |           |(O=1,Interface_Address=INF2,OUT_VLAN_ID=VLAN_R3_R4)|
+--------------------------------------------------------------------------+
|M3   |PCE/R4|PCInitiate|CC-ID=X1                                           |
|M3-R|       |PCRpt      |VLAN crossing CCI Object(IN)                       |
|     |       |           |(O=0,Interface_Address=INF1,IN_VLAN_ID=VLAN_R3_R4) |
|     |       |           |VLAN crossing CCI Object(OUT)                      |
|     |       |           |(O=1,Interface_Address=INF2,OUT_VLAN_ID=VLAN_R4_R6)|
+--------------------------------------------------------------------------+
|M4   |PCE/R6|PCInitiate|CC-ID=X1                                           |
|M4-R|       |PCRpt      |VLAN crossing CCI Object(IN)                       |
|     |       |           |(O=0,Interface_Address=INF1,IN_VLAN_ID=VLAN_R4_R6) |
|     |       |           |VLAN crossing CCI Object(OUT)                      |
|     |       |           |(O=1,Interface_Address=INF2,OUT_VLAN_ID=0)         |
+--------------------------------------------------------------------------+
```

Next Step

- More solutions & comments are welcome.

wangy73@chinatelecom.cn
wangaj3@chinatelecom.cn
IETF112