Updates for PCEP Extension for Native IP Network

draft-ietf-pce-pcep-extension-native-ip-26

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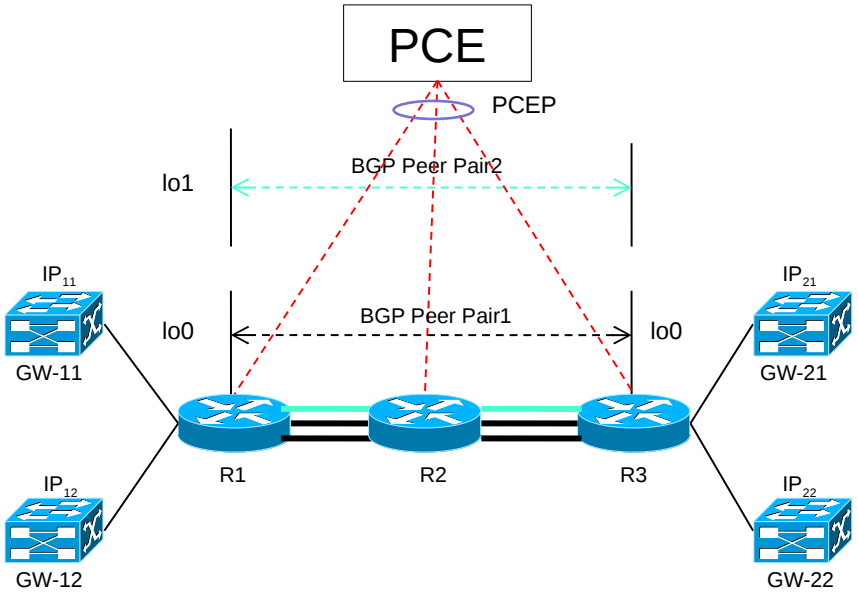
Motivation

- Introduce the updates for “PCEP extension for Native IP Network”
- Get feedback from PCE experts and make consensus
- Ready for IESG Last Call

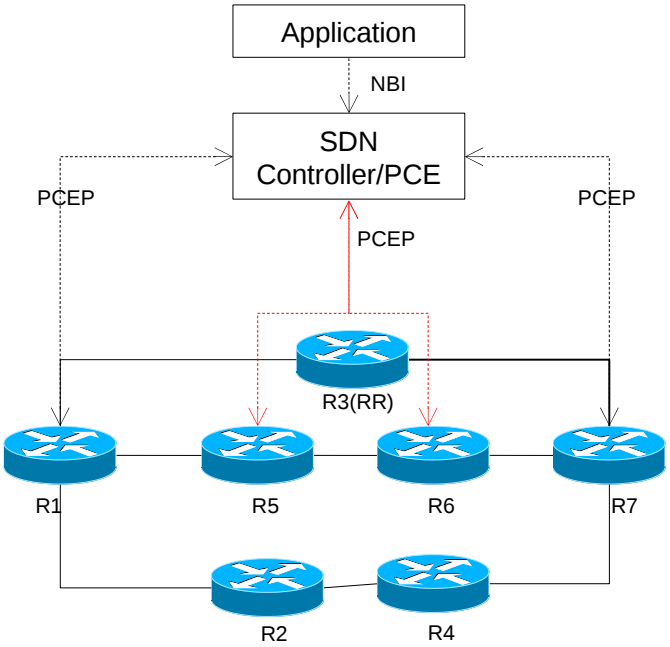
Backgrounds of the Solution

- RFC8735 describes the scenarios and simulation results for TE in Native IP network
- RFC 8821 describes the architecture for providing traffic engineering in a native IP network by using multiple BGP sessions and a PCE-based central control mechanism.
- This document describes the PCEP extensions and procedures to practically build such architecture.

Recap: Overview of the Solution



Dual/Multi-BGP Solution



Simplified CCDR* Architecture in a Large Network

- Building Dual/Multi BGP sessions between edge routers upon request via PCEP
- Advertises different prefixes via different BGP sessions, w/PCEP-based setup
- Steer traffic towards particular routes via BGP next-hop w/PCEP-based setup

CCDR* - Centralized Control Dynamic Routing, RFC 8735

Main Updates since WG LC

① Message Table Message Flow Chart

② Added the “status” field within BPI Object

③ Changed the encoding of PPA Object

④ Added “Manageability Considerations” Section

Message Table Message Flow Chart

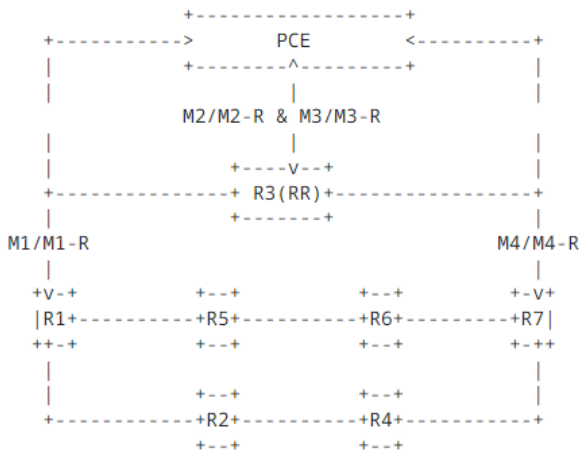


Figure 1: BGP Session Establishment Procedures(R3 act as RR)

Message Flow Chart is more clear and can reflect the timing relationship among these messages.

Updates for three main procedures:

1) BGP Session Establishment
2) Explicit Route Establishment
3) BGP Prefix Advertisement

The message number, message peers, message type and message key parameters in the above figures are shown in below table:

Table 1: Message Information

No.	Peers	Type	Message Key Parameters
M1 M1-R	PCE/R1	PCInitiate PCRpt	CC-ID=X1(Symbolic Path Name=Class A) BPI Object(Peer AS, Local_IP=R1_A,Peer_IP=R3_A)
M2 M2-R	PCE/R3	PCInitiate PCRpt	CC-ID=X2(Symbolic Path Name=Class A) BPI Object(Peer AS, Local_IP=R3_A,Peer_IP=R1_A)
M3 M3-R	PCE/R3	PCInitiate PCRpt	CC-ID=X3(Symbolic Path Name=Class A) BPI Object(Peer AS, Local_IP=R3_A,Peer_IP=R7_A)
M4 M4-R	PCE/R7	PCInitiate PCRpt	CC-ID=X4(Symbolic Path Name=Class A) BPI Object(Peer AS, Local_IP=R7_A,Peer_IP=R3_A)

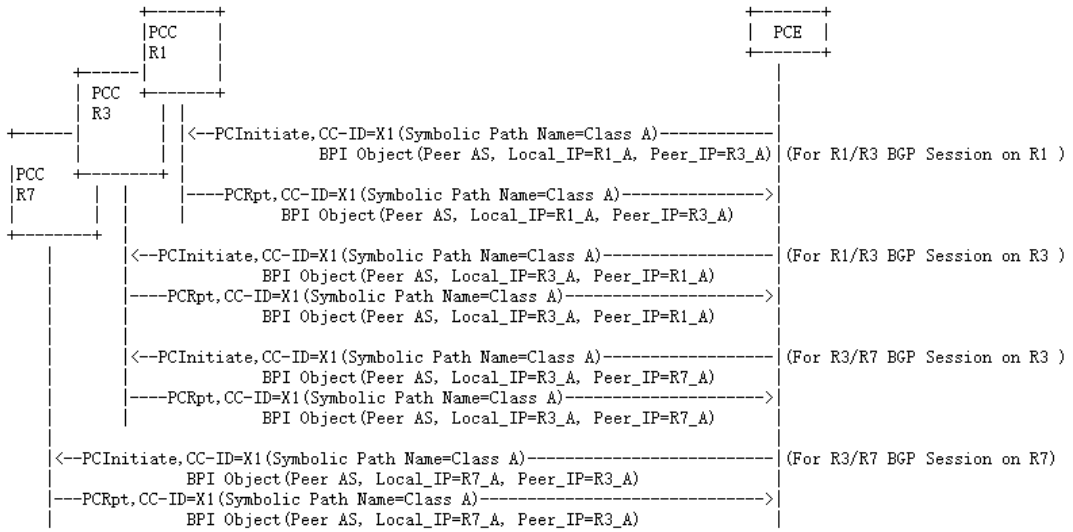


Figure 2: Message Information and Procedures

Updated BPI Object

The format of the BGP Peer Info object body for IPv4(Object-Type=1) is as follows:

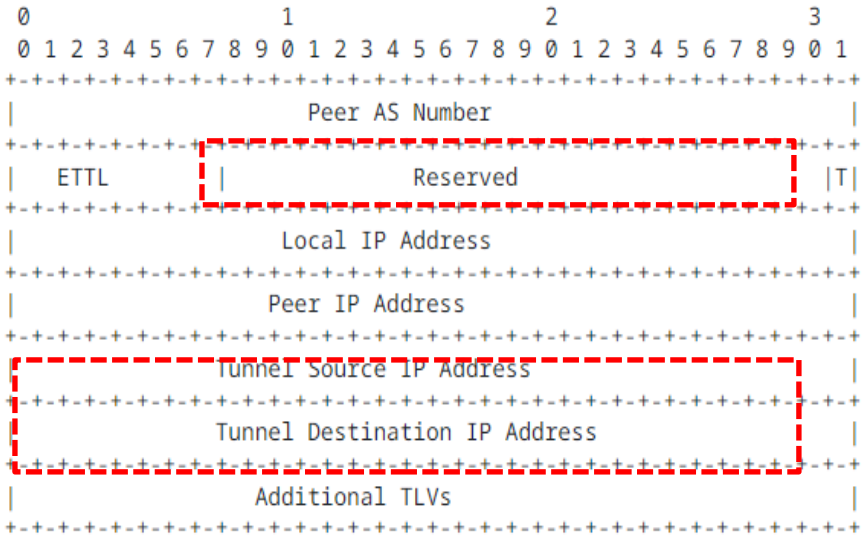


Figure 6: BGP Peer Info Object Body Format for IPv4

Previous Format

ormat of the BGP Peer Info object body for IPv4 (Object-Type=1) is as follows:

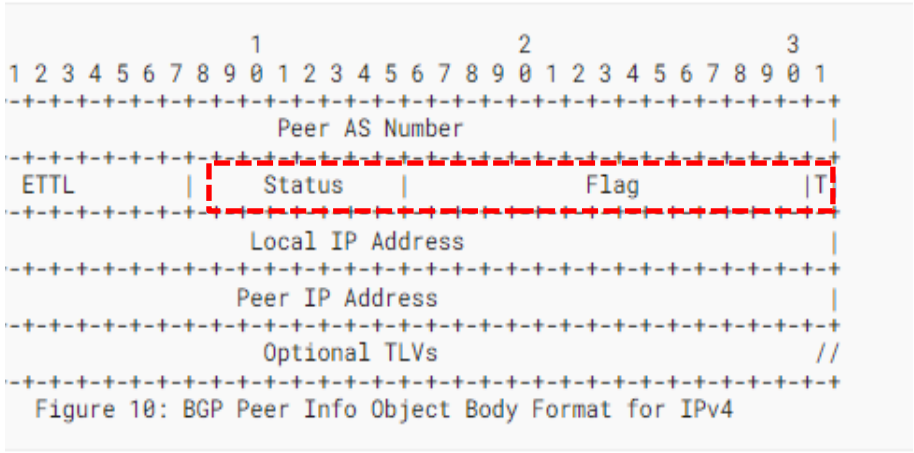


Figure 10: BGP Peer Info Object Body Format for IPv4

Current Format

1. Removed Tunnel Source/Destination IP Address. When tunnel mode is needed, use the Local/Peer IP Address as tunnel source/destination directly.
2. Newly defined “Status” field to reflect the BGP session status dynamically.
3. Newly defined “Flag” field in the original “Reserved” bits for future extensibility.

“Status” Field within BPI Object

Use PCRpt message to report the BGP Session status asynchronously via BPI Object

Status: 1 Byte, Indicate BGP session status between the peers.
It's values are defined below:

0: Reserved

1: BGP Session Established

2: BGP Session Establishment In Progress

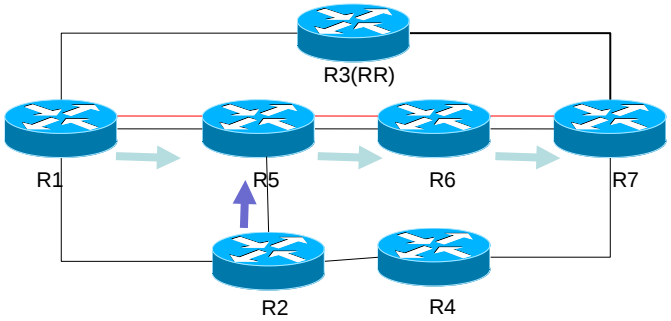
3: BGP Session Disabled

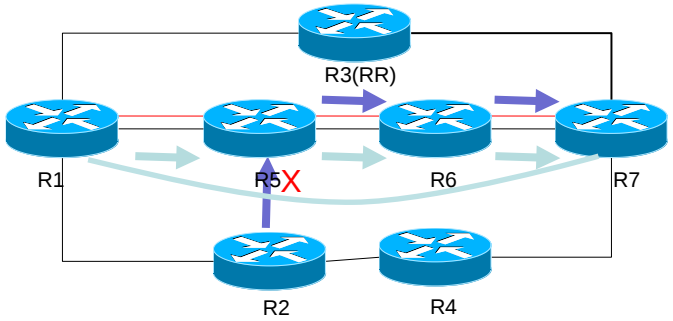
4: ASes does not match, BGP Session Failure

5: Peer IP can't be reached, BGP Session Failure

6-255: Reserved

Tunnel Mode/Raw Mode Explain





Raw Mode Traffic Forwarding

- ✓ Destination of user traffic based
- ✓ Traffic from different sources to the same destination may share the priority path
- ✓ Moderate traffic path control

Tunnel Mode Traffic Forwarding

- ✓ Destination of tunnel based
- ✓ Traffic for different (source, address) tuple are put into different tunnel
- ✓ Strict traffic path control

Use “T” bit to control the selection. “T” bit set is tunnel mode, else raw mode

Updated PPA Object

The format of the Peer Prefix Advertisement object body is as follows:

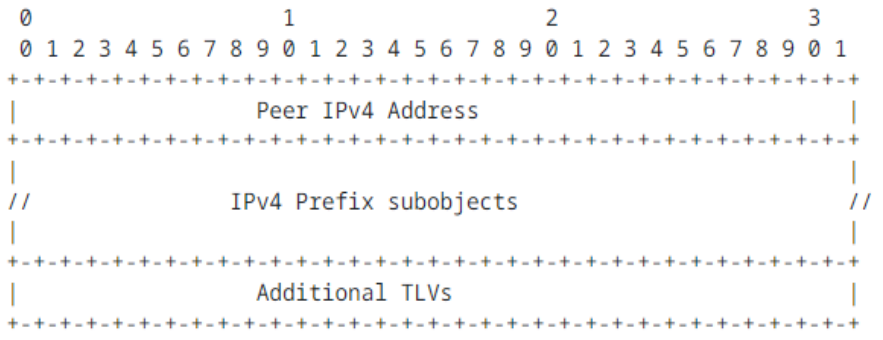


Figure 10: Peer Prefix Advertisement Object Body Format for IPv4

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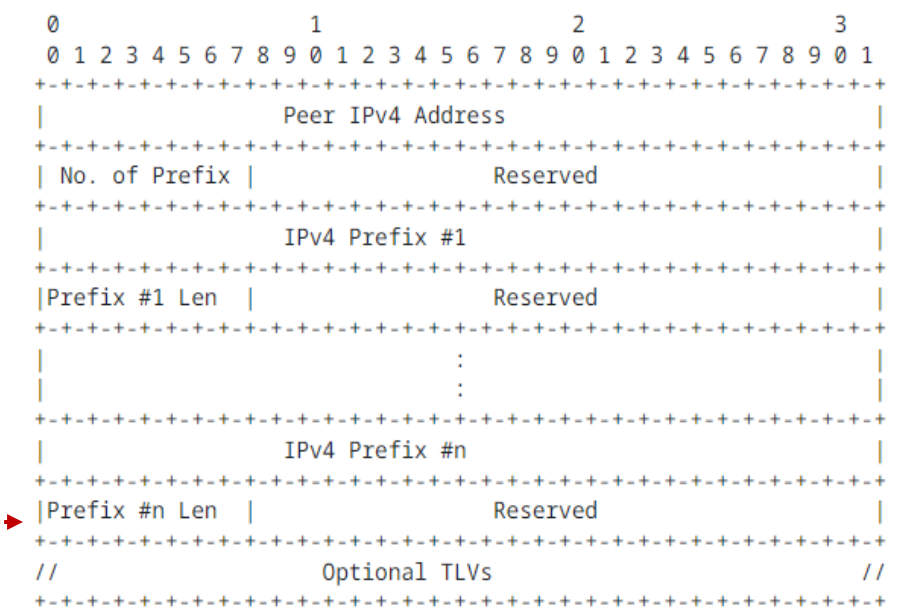

Figure 14: Peer Prefix Advertisement Object Body Format for IPv4

Update the PPA(Peer Prefix Advertisement) Object for easy parsing.

Add “Manageability Consideration” Section

11. Manageability Considerations

11.1. Control of Function and Policy

A PCE or PCC implementation SHOULD allow the PCECC NATIVE-IP-TE-CAPABILITY capability to be enabled/disabled as part of the global configuration.

11.2. Information and Data Models

[RFC7420] describes the PCEP MIB; this MIB can be extended to get the PCECC NATIVE-IP-TE-CAPABILITY capability status. The PCEP YANG [I-D.ietf-pce-pcep-yang] module could be extended to enable/disable the PCECC NATIVE-IP-TE-CAPABILITY capability.

11.3. Liveness Detection and Monitoring

Mechanisms defined in this document do not imply any new liveness detection and monitoring requirements in addition to those already listed in [RFC5440]. The operator relies on existing IP liveness detection and monitoring.

11.4. Verify Correct Operations

Verification of the mechanisms defined in this document can be built on those already listed in [RFC5440], [RFC8231] and [RFC9050]. Further, the operator needs to be able to verify the status of BGP sessions and prefix advertisements.

11.5. Requirements on Other Protocols

Mechanisms defined in this document requires the interaction with BGP. Section 9 describes in detail the considerations regarding to the BGP. During BGP session configuration , implementation MUST NOT allow the use local/remote IP address already sent tin the BPI object.

11.6. Impact on Network Operations

[RFC8821] describes the various deployment considerations in CCDR architecture and their impact on network operations.

Next Step

1. Comments/Q&A
2. IESG Last Call?

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