Gap Analysis of
IPv6 Multicast Source Routing (MSR6)

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Zhenbin Li, Huawei

Gyan Mishra, Verizon

Zhuangzhuang Qin, China Unicom

Contents

- MSR6 Introduction

- Gap Analysis

- Summary

Multicast Source Routing (MSR) over IPv6
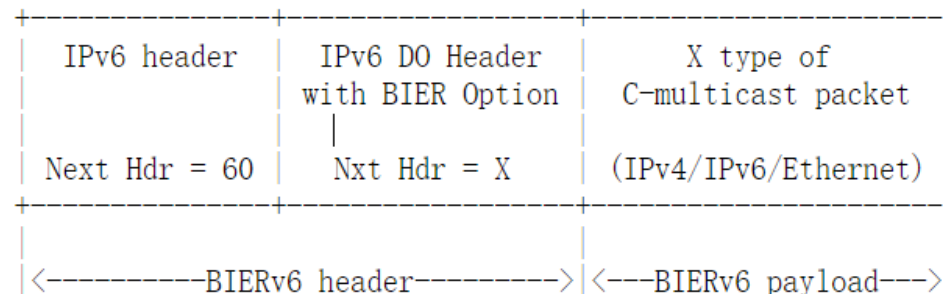
- MSR6 Scope

  – Best Effort Multicast Service

  – MVPN

  – Traffic Engineering Multicast Service based on Source Routing

  – IPv6 Multicast Protection and FRR

  – P2MP OAM functions

  – Support combining with other IPv6-based functionalities including network slicing, IOAM, Alternate Marking, APN, etc.

- MSR6 is related to BIER/PIM/SPRING/IPv6

  – Take full use of the existing solutions including IPv6, SRv6, BIER, etc.

  – Analysis of the existing multicast solutions to make clear the gap

Gap Analysis: BIERin6

```
+-----------------+-----------------+-----------------------+
| IPv6 header     | BIER Header     |    X type of           |
|                 | defined in      | C-multicast packet     |
| Ethertype=      |   RFC8296       |                        |
|   0xAB37        | Protocol = X    | (IPv4/IPv6/Ethernet)   |
+-----------------+-----------------+-----------------------+
|                 |                 |                        |
|<-IPv6 header->|<--BIER Header--->|<--BIERin6 Payload--->|
```

1. Support non-native IPv6 scenarios : In BIERin6, IPv6 is only used as the transport tunnel to transit the IPv6 domain.

2. Architecture Considerations:

    ① When the BIER layer is treated as an independent layer to support existing IPv6 features, the new encapsulation for fragment, security, network slicing, DetNet, IOAM may has to be defined in the BIER layer.

    ② When the BIER encapsulation is treated as a separate layer and the rest of the functionalities are realized in the IPv6 layer, it also causes problems. For example, For example, if encryption is supported in the IPv6 data plane, it makes the contents of the BIER layer encrypted and unprocessable.

3. BIERin6 is hard to complete end-to-end service to support host initiating source routing.

4. Maintenance of tunnel state: BIERin6 needs to maintain the state of the tunnel in the middle nodes when traversing IPv6 domains, which adds complexity to service deployment.

5. Based on existing functionalities, MVPN/TE/Fragmentation/ESP need be supported by BIERin6.

Gap Analysis: BIERv6

```
+---------------+------------------+--------------------+
| IPv6 header   | IPv6 DO Header   |     X type of      |
|               | with BIER Option |  C-multicast packet|
|               |        |         |                    |
| Next Hdr = 60 |  Nxt Hdr = X     |  (IPv4/IPv6/Ethernet)|
+---------------+------------------+--------------------+
|               |                  |                    |
|<----------BIERv6 header--------->|<---BIERv6 payload--->|
```

- BIERv6 uses Native IPv6 extension header to carry BIER info.

  - BIERv6 could support MVPN by defining MVPN indication in source address of the outer IPv6 header.

  - BIERv6 is able to directly reuse the new functionalities supported by IPv6 and SRv6 without the problems associated with Layered Architecture.

  - BIERv6 uses Native IPv6 and can be started directly at the host without conflicts with the transport layer.

- BIERv6 has the following challenges:

  - Non-MPLS BIER header defined in [RFC8296] is used, but the BIER header is designed as a separate layer, leaving some fields unused and redundant in IPv6.

  - BIERv6 needs to support MVPN and Traffic Engineering.

Summary

- The existing multicast solutions are not sufficient for MSR6 to support future potential multicast use case

- It is the right time to expect a new multicast solution

- How to promote MSR6 in the next step, PIM WG, SPRING WG or a new WG?

Thanks