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Encapsulation of Path Segment in SRv6
draft-li-6man-srv6-path-segment-encap-06

Abstract

Segment Routing (SR) allows for a flexible definition of end-to-end paths by encoding an ordered list of instructions, called "segments". The SR architecture can be implemented over an IPv6 data plane, called SRv6. In some use-cases such as end-to-end SR Path Protection and Performance Measurement (PM), an SRv6 path needs to be identified. An SRv6 Path Segment can be used for identifying an SRv6 path. This document defines a P-flag in the Segment Routing Header to indicate the appearence of SRv6 Path Segment.

Status of This Memo

This Internet-Draft is submitted in full conformance with the provisions of BCP 78 and BCP 79.

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1. Introduction

Segment routing (SR) [RFC8402] is a source routing paradigm that explicitly indicates the forwarding path for packets at the ingress node by inserting an ordered list of instructions, called segments.

When segment routing is deployed on an IPv6 data plane, it is called SRv6, and it uses a new IPv6 [RFC8200] Routing Header (EH) called the IPv6 Segment Routing Header (SRH) [RFC8754] to construct an SRv6 path. As per [RFC8986], an SRv6 segment identifier is a 128-bit value.

In several use cases, such as binding bidirectional path [I-D.ietf-pce-sr-bidir-path] and end-to-end performance measurement [I-D.gandhi-spring-twamp-srpm], the ability to implement path identification is a pre-requisite.

An SRv6 path MAY be identified by the content of a segment list in the SRH. However, the segment list may not be a good key, since the length of a segment list is flexible according to the number of required SIDs. Also, the length of a segment list may be too long to be a key when it contains many SIDs. For instance, if packet A uses

an SRH with 3 SIDs while Packet B uses an SRH with 10 SIDs, the key to identify these two paths will be a 384-bits value and a 1280-bits value, respectively. Furthermore, an SRv6 path cannot be identified by the information carried by the SRH in reduced mode [RFC8754] as the first SID is not present. Also, different SRv6 policies may use the same segment list for different candidate paths, so the traffic of different SRv6 policies are merged, resulting in the inability to measure the performance of the specific path. Therefore, [I-D.ietf-spring-srv6-path-segment] defines an SRv6 Path Segment to identify an SRv6 path.

This document defines a P-bit in SRH to indicate the appearence of SRv6 Path Segment in SRH.

1.1. Requirements Language

The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT", "SHOULD", "SHOULD NOT", "RECOMMENDED", "NOT RECOMMENDED", "MAY", and "OPTIONAL" in this document are to be interpreted as described in BCP 14 [RFC2119] [RFC8174] when, and only when, they appear in all capitals, as shown here.

1.2. Terminology

PM: Performance Measurement.

SID: Segment ID.

SL: Segment List.

SR: Segment Routing.

SRH: Segment Routing Header.

PSID: Path Segment Identifier.

PSP: Penultimate Segment Popping.

Further, this document makes use of the terms defined in [RFC8402] and [RFC8986].

2. Encoding of an SRv6 Path Segment

This section describes the SRH encoding of an SRv6 Path Segment [I-D.ietf-spring-srv6-path-segment].

2.1. SRH.P-flag

As per [I-D.ietf-spring-srv6-path-segment], an SRv6 Path Segment is a 128-bits value, and it MUST appear only once in a SID list, and it MUST appear as the last entry.

To indicate the existence of a Path Segment in the SRH, this document defines a P-flag in the SRH flag field. The encapsulation of SRv6 Path Segment is shown below.

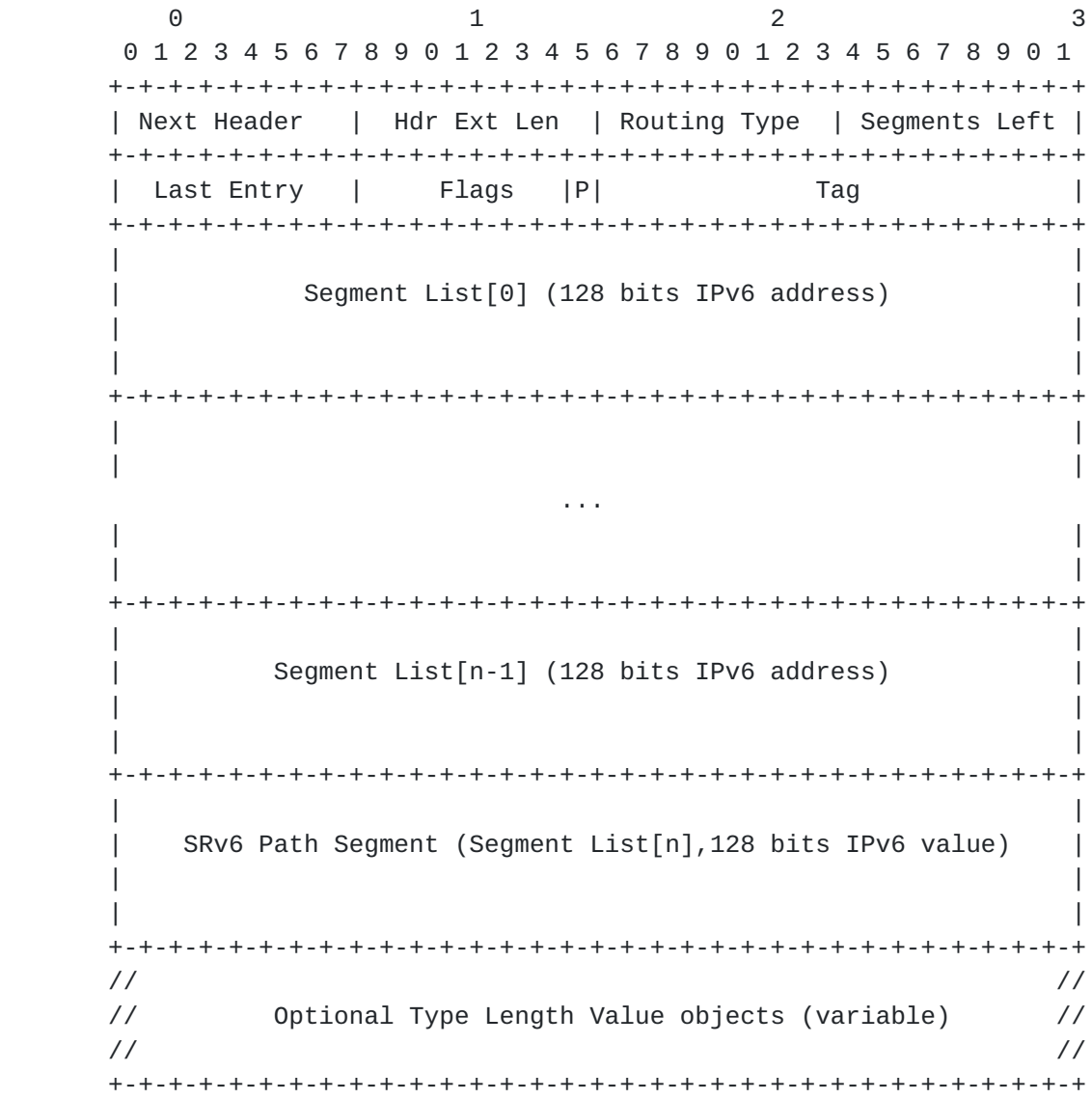

Figure 1. SRv6 Path Segment in SID List

o P-bit: set when SRv6 Path Segment is inserted. It MUST be ignored when a node does not support SRv6 Path Segment processing.

SRH.P-bit processing can be enabled or disabled by configuration on devices, it can be done by CLI, NETCONF YANG or other ways, and this is out of the scope of this document.

The pseudo code of SRH.P-bit processing is described as below.

```
S01.  if SRH.P-flag processing is enabled:
S02.     if SRH.P-flag is set:
S03.        SRv6 Path Segment processing       ;;ref1
```

Ref1: The SRv6 Path Segment processing is accosiated with the specific application, such as SRv6 Path Segment based Performance measurement, and this is out of the scope of this document.

In some use cases, only the egress need to process the SRv6 Path Segment, therefore, the P-bit processing can be done at the egress node only while the intermediate nodes do not need to process it. This feature can be enabled by configuration like CLI , NETCONF YANG or other ways. In this case, the pseudo code is described as below.

```
S01.  if SRH.P-flag processing is enabled:
S02.    if intermediate node processing is disabled:
S03.        if SRH.P-flag is set and SRH.SL == 0:
S03.            SRv6 Path Segment processing
S04     else:
S05.        if SRH.P-flag is set:
S06.            SRv6 Path Segment processing
```

3. Processing of SRv6 Path Segment

The processing of SRv6 path segment is out of the scope of this document and is defined in [I-D.ietf-spring-srv6-path-segment].

4. IANA Considerations

This document requests IANA to allocate bit position TBA within the "Segment Routing Header Flags" registry defined in [RFC8402].

5. Security Considerations

TBA

6. Acknowledgements

TBA

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7.1. Normative References

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