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The SRv6 END.DTM Endpoint Behavior
draft-bonica-spring-srv6-end-dtm-04

Abstract

This document describes a new SRv6 endpoint behavior, called END.DTM. END.DTM supports inter-working between SRv6 and SR-MPLS. Like any endpoint behavior, END.DTM contains a function and arguments. The function causes the processing node to decapsulate a packet, impose an SR-MPLS label stack and forward the packet. The arguments determine SR-MPLS label stack contents.

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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This Internet-Draft will expire on August 26, 2021.

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1. Overview

Segment Routing (SR) [RFC8402] allows source nodes to steer packets through SR paths. It can be implemented over IPv6 [RFC8200] or MPLS [RFC3031]. When SR is implemented over IPv6, it is called SRv6 [I-D.ietf-spring-srv6-network-programming]. When SR is implemented over MPLS, it is called SR-MPLS [RFC8660].

This document describes a new SRv6 endpoint behavior, called END.DTM. END.DTM supports inter-working between SRv6 and SR-MPLS. Like any endpoint behavior, END.DTM contains a function and arguments. The function causes the processing node to:

- Decapsulate a packet (i.e., remove an IPv6 header and its extensions).
- Impose an SR-MPLS label stack.
- Forward the packet.

The arguments determine MPLS-label stack contents and anything that might be encoded in the MPLS-label stack (e.g., transport class [I-D.hegde-spring-mpls-seamless-sr])

2. 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.

3. Use-case

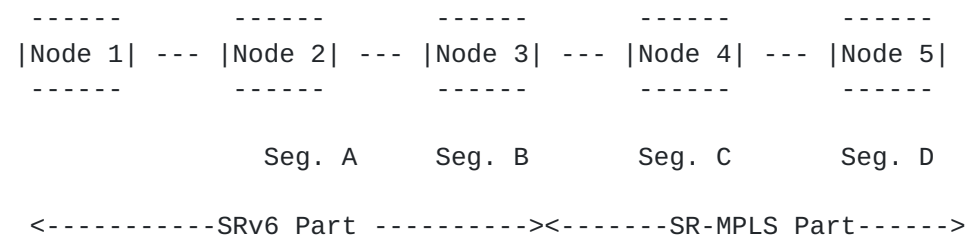

Figure 1: END.DTM Use-case

Figure 1 depicts an inter-working SR path. The SR path originates on Node 1 and terminates on Node 5. It contains:

- An SRv6 part
- An SR-MPLS part

The SRv6 part includes Nodes 1, 2 and 3. Nodes 1 and 2 MUST be SRv6-capable but are NOT REQUIRED to be SR-MPLS capable. An END.DTM segment is instantiated on Node 3. Therefore, Node 3 MUST be SRv6-capable and SR-MPLS capable.

The SRv6 part also includes:

- Segment A - An END segment that is instantiated on Node 2.
- Segment B - An END.DTM segment that is instantiated on Node 3.

The SR-MPLS part includes Nodes 4 and 5. These nodes MUST be SR-MPLS-capable but are NOT REQUIRED to be SRv6 capable.

The SR-MPLS part also includes:

- Segment C - A prefix segment that is instantiated on Node 4.
- Segment D - A prefix segment that is instantiated on Node 5.

The following paragraphs describe how a packet traverses this inter-working SR path:

Node 1 encapsulates the packet in an SRv6 header. The SRv6 header contains the following Segment Identifiers (SID):

- A SID representing Segment A, encoded in the Destination Address field of the IPv6 header.
- A SID representing Segment B, encoded in a Segment Routing Header (SRH) [RFC8754].

Node 1 sends the packet to Node 2. When the packet arrives at Node 2, The Destination Address field in the IPv6 header represents a locally instantiated END SID. Node 2 processes the packet as follows:

- Decrement the Segments Left field in the SRH
- Copy the next SID from the SRH to the Destination Address field of the IPv6 header.
- Forward the packet to Node 3.

When the packet arrives at Node 3, The Destination Address field in the IPv6 header represents a locally instantiated END.DTM SID. Node 3 processes the packet as follows:

- Decapsulate the packet (i.e., remove the IPv6 header and its extensions, including the SRH)
- Push two SR-MPLS label stack entries, representing Segments D and C. Set the MPLS Traffic Class and TTL values to reflect the Traffic Class and Hop count values received in the IPv6 header.
- Forward the packet to Node 4.

When the packet arrives at Node 4, it is encapsulated in an SR-MPLS label stack. Node 4 processes the packet as described in SR-MPLS [RFC8660].

4. Processing

The End.DTM SID MUST be the last segment in a SR Policy. Its arguments are associated with an SR-MPLS label stack.

When Node N receives a packet destined to S and S is a locally instantiated End.DTM SID, Node N executes the following procedure:

```
S01. When an IPv6 Routing Header is processed {
S02.   If (Segments Left != 0) {
S03.      Send an ICMP Parameter Problem to the Source Address,
             Code 0 (Erroneous header field encountered),
             Pointer set to the Segments Left field,
             interrupt packet processing and discard the packet.
S04.   }
S05.   Proceed to process the next header in the packet
S06. }
```

When processing the Upper-layer header of a packet matching a FIB entry locally instantiated as an End.DTM SID, N executes the following procedure:

S01. Decapsulate the packet (i.e., remove the outer IPv6 Header and all its extension headers)
S02. Push the SR-MPLS label stack that is associated with the END.DTM arguments. Set the MPLS Traffic Class and TTL values to reflect the Traffic Class and Hop count values received in the IPv6 header.
S03. Submit the packet to the MPLS FIB lookup for transmission to the new destination

5. IANA Considerations

This document requires no IANA action.

The authors will request an early allocation from the "SRv6 Endpoint Behaviors" sub-registry of the "Segment Routing Parameters" registry.

6. Security Considerations

Because SR inter-working requires co-operation between inter-working domains, this document introduces no security consideration beyond those addressed in [RFC8402], [RFC8754] and [I-D.ietf-spring-srv6-network-programming].

7. Acknowledgements

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8.1. Normative References

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