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The SRv6 END.DTM Endpoint Behavior
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Abstract

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

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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. The END.DTM endpoint behavior 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:

o Remove an SRv6 header (i.e., an IPv6 header and its extensions).

o Impose an SR-MPLS label stack.

o Forward the packet to its next hop.

The arguments determine:

o MPLS-label stack contents and anything that might be encoded in the MPLS-label stack (e.g., Transport Class of the MPLS Tunnel).

o The next hop.

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

```
      ------       ------       ------       ------       ------
     |Node 1| --- |Node 2| --- |Node 3| --- |Node 4| --- |Node 5|
      ------       ------       ------       ------       ------

                     Seg. A     Seg. B       Seg. C       Seg. D

      <-----------SRv6 Part ----------><-------SR-MPLS Part------>
```

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:

o An SRv6 part

o An SR-MPLS part

The SRv6 part includes Nodes 1, 2 and 3. These nodes 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 able to push an SR-MPLS label stack. However, it is NOT REQUIRED to process incoming MPLS labels.

The SRv6 part also includes:

o Segment A - An END segment that is instantiated on Node 2.

o 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:

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

o 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):

- o A SID representing Segment A, encoded in the Destination Address field of the IPv6 header.

- o 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:

- o Decrement the Segments Left field in the SRH

- o Copy the next SID from the SRH to the Destination Address field of the IPv6 header.

- o 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:

- o Remove the IPv6 header and its extension headers (including the SRH).

- o Push two SR-MPLS labels, representing Segments D and C.

- o 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:

- o An SR-MPLS label stack.

- o An outbound interface.

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. Remove the outer IPv6 Header with all its extension headers
S02. Push the SR-MPLS label stack that is associated with the END.DTM arguments
S03. Send the packet on the out interface associated with the END.DTM arguments

5. IANA Considerations

IANA is requested to add the following entry to the "SRv6 Endpoint Behaviors" sub-registry of the "Segment Routing Parameters" registry:

Value	Hex	Endpoint behavior	Reference
TBD	TBD	END.DTM	[This.ID]

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. References

8.1. Normative References

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