SRv6 Proxy Forwarding
draft-chen-rtgwg-srv6-midpoint-protection-00

Abstract

   The endpoints of a SRv6 path are given by a SRv6 Policy. When an
   endpoint node fails, we need bypass this failed endpoint node and
   forward the packets to the failed node's next endpoint node.

Requirements Language

   The key words "MUST", "MUST NOT", "REQUIRED", "SHALL", "SHALL NOT",
   "SHOULD", "SHOULD NOT", "RECOMMENDED", "MAY", and "OPTIONAL" in this
   document are to be interpreted as described in RFC 2119 [RFC2119].

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1. Introduction

"Segment Routing Proxy Forwarding" for IPv4 is defined in
[I-D.hu-spring-segment-routing-proxy-forwarding]. It provides the
protections for the middle endpoints of a SR path. This document
specifies the proxy forwarding for SRv6, which supports the
protections for the middle endpoints of a SRv6 path.

The endpoints of a SRv6 path are given by a SRv6 Policy. When an
endpoint node fails, we need bypass this failed endpoint node and
forward the packets to the failed node's next endpoint node. On the
PLR (i.e., the previous hop node of the failed endpoint node), it
performs the bypass protection as follows if NH = SRH and SL != 0.

If the outbound interface fails and the failed endpoint node (FN for
short) is directly connected to the PLR, then the PLR forwards the
packets through a bypass to the FN's next endpoint node. If it is
not directly connected, the normal Ti-LFA is executed.

If it is a FIB miss, the PLR forwards the packets through a bypass to
the FN's next endpoint node. There is no need to check if the failed
endpoint node is directly connected to the PLR.

2. Endpoint Node Protection for Segment List

2.1. Transit Node as PLR

   When the PLR is a transit node, it provides fast protection against
   the endpoint node failure as follows after looking up the FIB.

```
   IF the primary outbound interface used to forward the packet failed
     IF NH = SRH && SL != 0, and
        the failed endpoint is directly connected to the PLR THEN
       SL--; update the IPv6 DA with SRH[SL];
       FIB lookup on the updated DA;
       forward the packet according to the matched entry;
     ELSE
       forward the packet according to the backup nexthop;
   ELSE // there is no FIB entry for forwarding the packet
     IF NH = SRH && SL != 0 THEN
       SL--; update the IPv6 DA with SRH[SL];
       FIB lookup on the updated DA;
       forward the packet according to the matched entry;
     ELSE
       drop the packet;
```

                        Figure 1: PLR transit

2.2. Endpoint Node as PLR

   When a node N receives a packet, if the destination address (DA) of
   the packet is a local END SID, then node N is an endpoint node.

   When the PLR is an endpoint node, it provides fast protections for
   the failure through executing the following procedure after looking
   up the FIB for the updated DA.

```
   IF the primary outbound interface used to forward the packet failed
     IF NH = SRH && SL != 0, and
         the failed endpoint is directly connected to the PLR THEN
       SL--; update the IPv6 DA with SRH[SL];
       FIB lookup on the updated DA;
       forward the packet according to the matched entry;
     ELSE
       forward the packet according to the backup nexthop;
   ELSE // there is no FIB entry for forwarding the packet
     IF NH = SRH && SL != 0 THEN
       SL--; update the IPv6 DA with SRH[SL];
       FIB lookup on the updated DA;
       forward the packet according to the matched entry;
     ELSE
       drop the packet;
 //ELSE
 //  forward accordingly to the matched entry;
```

                        Figure 2: PLR endpoint

2.3. Endpoint x Node as PLR

   An endpoint node with cross-connect (End.X for short) is an endpoint
   node with an array of layer 3 adjacencies.

   When a node N receives a packet, if the destination address (DA) of
   the packet is a local END.X SID, then node N as PLR provides fast
   protections for the failure through executing the following procedure
   after updating DA.

```
   IF the layer-3 adjacency interface is down THEN
     FIB lookup on the updated DA;
     IF the primary interface used to forward the packet failed THEN
       IF NH = SRH && SL != 0, and
          the failed endpoint is directly connected to the PLR THEN
         SL--; update the IPv6 DA with SRH[SL];
         FIB lookup on the updated DA;
         forward the packet according to the matched entry;
       ELSE
         forward the packet according to the backup nexthop;
     ELSE // there is no FIB entry for forwarding the packet
       IF NH = SRH && SL != 0 THEN
         SL--; update the IPv6 DA with SRH[SL];
         FIB lookup on the updated DA;
         forward the packet according to the matched entry;
       ELSE
         drop the packet;
//ELSE
//  forward accordingly to the matched entry;
```

                    Figure 3: PLR endpoint cross-connect

2.4. Endpoint t Node as PLR

   An endpoint node with specific IPv6 table (End.T for short) is an
   endpoint node with specific IPv6 table lookup function.

   When a node N receives a packet, if the destination address (DA) of
   the packet is a local END.T SID, then node N as PLR provides fast
   protections for the failure through executing the following procedure
   after looking up the next segment in IPv6 table T associated with the
   SID.

```
  IF the primary interface used to forward the packet failed THEN
    IF NH = SRH && SL != 0, and
       the failed endpoint is directly connected to the PLR THEN
      SL--; update the IPv6 DA with SRH[SL];
      lookup the next segment in IPv6 table T associated with the SID;
      forward the packet according to the matched entry;
    ELSE
      forward the packet according to the backup nexthop;
  ELSE // there is no FIB entry for forwarding the packet
      IF NH = SRH && SL != 0 THEN
        SL--; update the IPv6 DA with SRH[SL];
        lookup the next segment in IPv6 table T associated with the SID;
        forward the packet according to the matched entry;
      ELSE
        drop the packet;
//ELSE
//  forward accordingly to the matched entry;
```

Figure 4: PLR endpoint table

3. IANA Considerations

TBD

4. Security Considerations

TBD

5. Acknowledgements

TBD

6. References

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