BIER-TE Egress Protection

draft-chen-bier-te-egress-protect-00

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IETF 110
Introduction

BIER-TE Egress Protection (EP)

• Fast protection for egresses in BIER-TE domain

• No per-flow state in the core
BIER-TE Egress Protection (EP) Idea

1. Configure backup egress to protect an egress (e.g., H is configured to protect D on D)
2. Egress distributes its backup to its neighbors (e.g., D distributes “H backup D” to C and G)
3. Neighbors extend their BIFTs to protect egress (e.g., C extends its BIFT to protect D, G extends its BIFT to protect D),
4. Egress fails, forwards packets to backup egress, sending packets to CE receiver.
Extended BIFT for EP

Extended BIFT on BFR X has a backup entry for each egress connected to X

<table>
<thead>
<tr>
<th>BFR-id (SI:Bitstring)</th>
<th>Action</th>
<th>BFR-NBR (Next Hop)</th>
<th>Backup Entry (EPA,BackupPath)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18' (9:00100)</td>
<td>fw-connected</td>
<td>D</td>
<td>EPA=0, C→H:{10', 4}</td>
</tr>
<tr>
<td>12' (8:00010)</td>
<td>fw-connected</td>
<td>F</td>
<td>EPA=0, C→E:{3',2',3},</td>
</tr>
<tr>
<td>0' (7:10000)</td>
<td>fw-connected</td>
<td>H</td>
<td>EPA=0, C→D:{18',1}</td>
</tr>
<tr>
<td>3' (6:00100)</td>
<td>fw-connected</td>
<td>B</td>
<td>EPA=0,{[]} B is not BFER</td>
</tr>
</tbody>
</table>

1,2,3,4,5 BFER D,F,E,H,A's ID

1' (i=1, ...,20) BP for fw-con adjacency

Ex BIFT for EP

Backup Path to Backup egress H

Normal: forwards packet using normal BIFT
**Example BIER-TE EP**

**Path** A to D, F: {7’, 4’, 18’, 12’, 2, 1}

- **{4’,18’,12’,2,1}Pkt**
- **{18’,12’,2,1}Pkt**
- **{10’,2,4}Pkt**
- **{4’,18’,12’,2,1}Pkt**
- **{18’,12’,2,1}Pkt**

Packet with path in normal operations

Packet with path when BFER D fails

<table>
<thead>
<tr>
<th>BFR-NBR (Next Hop)</th>
<th>Backup Entry (EPA,BackupPath)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18’ D</td>
<td>EPA=1, C→H:{10’,4},</td>
</tr>
</tbody>
</table>

Backup Egress for D

Egress H protect D

Backup Egress for F

Egress E protect F

{2,1}Pkt

{2,1}Pkt

{2,4}Pkt
Updated Forwarding Procedure (1)

For BFR-NBR N as egress encoded in a packet,
EPA == 1? (N fails and protected?)
If so, clears BP for adjacency to N and BP for BFER N,
   If BP for N’s backup egress B == 0,
      copies and sends the packet to B along backup path.

Adds BPs for backup path into BitString
Updated Forwarding Procedure (2)

Packet = the packet received by BFR;
FOR each BP k (from the rightmost in Packet's BitString) {
    IF (BP k is local decap adjacency) {
        copies Packet, sends the copy to the multicast
        flow overlay and clears bit k in Packet's BitString
    }
    ELSE IF (BP k is forward connect adjacency of the BFR) {
        finds the forwarding entry in the BIER-TE BIFT for the domain
        using BP k
        IF (EPA == 1) {//Egress Protection for BFR-NBR/egress is Active
            Clears BP k and BP for BFR-NBR in Packet's BitString
            IF (BP for backup egress is 0 in Packet's BitString) {
                Adds BPs for backup path into Packet's BitString;
            }
        } //egress removed, backup path to backup egress added
        ELSE {
            Copies Packet, updates the copy's BitString by
            clearing all the BPs for the adjacencies of the BFR,
            and sends the updated copy to BFR-NBR
        }
    }
}

When egress N fails, if it is protected (EPA==1), then
packet to N is not sent to N, but
to N’s backup egress B along backup path if BP for B is 0.
Next Steps

• Welcome comments