BIER-TE for Broadcast Link

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IETF 112
Introduction

➢ Issue: Duplicated Packets in Existing BIER-TE with Broadcast Links

Path A to H, F: \(\{2', 4', 6', 12', 15', 2, 4\}\)

Figure 1. BIER-TE Topology with BPs on Broadcast Link

➢ Improved BIER-TE with Broadcast Links Resolving Issue
New BP Assignments for Broadcast Link

➢ For a broadcast link connecting X1, X2, ..., Xm, assuming they are connected a pseudo node Px (e.g., DR in OSPF or DIS in IS-IS).

➢ For connection between Px and X1, X2, ..., Xm, two BPs are assigned.
  • One is for *lan-connected* adjacency from Xi (i=1, 2, ..., m) to Px,
  • the other is for forward connected adjacency from Px to Xi.

➢ For *lan-connected* adjacency from Xi to Px, Xi acts as Px (i.e., after Xi “sends” packet to Px using main BIFT, Xi “sends” the packet to Px’s BFR-NBRs using secondary BIFT for Px)
Improved BIER-TE BIFT on BFR

For a BFR on broadcast link, its improved BIER-TE BIFT comprises:

- **main BIFT** containing a forwarding entry for *lan-connected* adjacency to Px.
- **secondary BIFT** for Px on BFR containing a forwarding entry for each of forward connected adjacencies from Px to BFRs attached to broadcast link except for the adjacency from Px to the BFR.

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### Adjacency BP (SI:Bitstring) | Action | BFR-NBR (Next Hop)
--- | --- | ---
5'(6:00010000) | fw-connected | B
12'(7:00001000) | fw-connected | F
14'(7:00100000) | *lan-connected* | Px

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### Main BIFT on BFR C

<table>
<thead>
<tr>
<th>Adjacency BP (SI:Bitstring)</th>
<th>Action</th>
<th>BFR-NBR (Next Hop)</th>
</tr>
</thead>
<tbody>
<tr>
<td>15'(7:01000000)</td>
<td>fw-connected</td>
<td>G</td>
</tr>
<tr>
<td>17'(8:00000001)</td>
<td>fw-connected</td>
<td>H</td>
</tr>
<tr>
<td>19'(8:00000100)</td>
<td>fw-connected</td>
<td>D</td>
</tr>
</tbody>
</table>

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### Secondary BIFT for Px on BFR C

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**Figure A.** Broadcast Link

**Figure B.** Improved BIER-TE BIFT on BFR C
Example Application of Improved BIER-TE

No Duplicated Packets in Improved BIER-TE with Broadcast Links

Path A to H, F: \{2', 4', 6', 12', 16', 17', 2, 4\}

Figure A. BIER-TE Topology with new BPs on Broadcast Link
Next Steps

● Comments
BIER Egress Protection

draft-chen-bier-egress-protect-03

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Overview

➢ BIER egress protection in previous versions
   a) H protect D, (assume: D’s and H’s BIER packet to same CE)

![Diagram]

1. Config D’s backup H to protect D
   a). D’s and H’s BIER packet to same CE as default

2. IGP distributes the info about D’s backup H

3. When detecting D’s failure, for packet destined to D, PLR C clears bit for D, sets bit for H, sends packet to H

➢ Extended for a) above and b)
   a) H protect D, D’s and H’s BIER packet to same CE (flag S=1, meaning Same CE)
   b) E protect F, F’s and E’s BIER packet to different CEs (S=0, meaning different CEs)
Egress Protection for case b)

1. E protect F with flag S=0 is configured
2. IGP distributes info about E protect F with S=0
   - PLR C extends its BIFT containing backup entry for F considering S
   - E has a mFIB for F and its BIFT including backup entry for F with pointer to mFIB for S=0
3. For packet with F, C sends it to K (TI-LFA to E) when detecting F’s failure
4. E, detecting F’s failure, acts as Proxy of F, decaps packet with F and uses mFIB for F to send payload to CE3.

3. When PLR C detects F’s failure, C sends packet with F to K (TI-LFA to E) since S=0 (When C detects D’s failure, for packet with D, clears D, sets H and sends it to H since S=1)

4. when E detects F’s failure, E uses forwarding behavior of F and acts as Proxy of F. E decaps packet with F, sends payload using mFIB for F.

1. Config F’s backup E to protect F a).
   b). F’s and E’s BIER packets to different CEs (F’s to CE3, E’s to CE4)

2. IGP distributes F’s backup E with b) (S=0)

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**BIFT on C**

<table>
<thead>
<tr>
<th>BFR-id</th>
<th>F-BM</th>
<th>NBR</th>
<th>BA</th>
<th>S</th>
<th>BE-BFER</th>
<th>BF-BM</th>
<th>B-NBR</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(00001)</td>
<td>00001</td>
<td>D</td>
<td>0</td>
<td>1</td>
<td>H</td>
<td>01001</td>
<td>H</td>
</tr>
<tr>
<td>2(00010)</td>
<td>00110</td>
<td>F</td>
<td>0</td>
<td>0</td>
<td>E</td>
<td>00010</td>
<td>K (TI-LFA)</td>
</tr>
</tbody>
</table>

**BIFT on E**

<table>
<thead>
<tr>
<th>BFR-id</th>
<th>F-BM</th>
<th>NBR</th>
<th>BA</th>
<th>S</th>
<th>BE-BFER</th>
<th>BF-BM</th>
<th>B-NBR/P-FIB</th>
</tr>
</thead>
<tbody>
<tr>
<td>1(00001)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2(00010)</td>
<td>00011</td>
<td>F</td>
<td>0</td>
<td>0</td>
<td>E (00100)</td>
<td>00010</td>
<td>P-FIB-4F</td>
</tr>
</tbody>
</table>

mFIB for F
Next Steps

• Welcome comments
BIER Fast Reroute

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Overview

➢ Addressed the comments

➢ Enough unanimous hands up in IETF 111

➢ Request for adoption call

Thanks