BFR Tethering

draft-zzhang-bier-tether-02

Zhaohui Zhang
Nils Warnke
Ice Wijnands
Daniel Awduche

IETF105, Montreal
Brownfield Deployment

How to handle BIER incapable routers?

• Get around them and/or tunnel through them
  • X in the below diagram does not support BIER
Tunnel Through Incapable Routers
And follow unicast topology

- Section 6.9 of BIER Architecture spec
  - At the end of SPF, examine each immediate child node on the SPF tree
  - If it’s not BIER capable, replace it with its immediate children
  - If a new child (that just replaced its parent) itself is incapable, replace it with its immediate children
  - The process is repeated until all immediate children are BIER capable
  - If a child is not directly connected, then a tunnel must be used to send BIER traffic to the child

- Any tunnel to the child can be used
  - Static or dynamic (e.g. LDP/SR/GRE)
  - *No need to announce the tunnels*
Tunneling Alone May Not Be Good Enough

- If the number of BFRs that X connects to is large, then BFR1 needs to tunnel many copies through that BFR1-X link
  - Not good if the BFR1-X connection is long distance and/or BW constrained
- A solution is to tether a BFRx to X with a fat local pipe
  - BFR1 tunnels a single copy to BFRx, who in turn tunnels to other BFRs
Making Tethering Easier

• X advertises that it supports BIER so it will receive BIER packets natively
  • The BIER packets come with a BIER label that normally directs to BIER forwarding
• X label switches (based on the BIER label) the BIER packets to BFRx
• BFRx uses the Section 6.9 method to tunnel incoming BIER packets from X to other BFRs through X

• Alternatively, BFRx signals “I am X’s helper”
  • Other BFRs use Section 6.9 method to tunnel over X to BFRx
Re-using Existing BFRs as Helpers

• If there are BFRs connected to the same non-BFR, any one or multiple ones can be used as helpers
  • The “I am X’s helper” signaling should carry a priority
    • The one with the highest priority is used as the helper
    • If multiple ones advertise the same priority
      • All could be used – but that means another BFR could tunnel multiple copies through X
      • For simplicity, the one with the highest BIER Prefix is used

• One helper can help multiple non-BFRs
  • See later slides

• With OSPF/ISIS signaling, the helper needs to be in the same area/level as the non-BFR that it helps.
  • See later slide about tethering with BGP signaling
Looping Concerns?
Stubby helpers will not cause loop

- A dedicated helper w/o any other connections
- A helper w/o (direct/indirect) connections back towards tunnel ingress
Looping Concerns: transit helpers?

- A helper MUST NOT send packets back towards tunnel ingress

- If BFRx-X metric is the smallest among all its connections that could lead to possible tunnel ingresses, no problem
  - Link metrics as shown are fine

- **The above can be relaxed if BFR1 runs an SPF rooted at the helper to make sure the helper won’t send packets back**
  - E.g. if BFRx-BFR1 metric is <=2, then BFR1 must tunnel to BFR3/4 directly w/o using helper
  - E.g. if BFRx-BFR1 is 1 and BFR1-X is 2 then BFRx-X can be 2
  - *The SPF is already done as part of LFA*
Looping Concerns: One Helper for Multiple Helped?

- Just a specific case of transit helpers
- Already covered by previous slide
- If there is still concern with transit helpers wrt possible loop, node slicing can be used to create a stub helper
Tethering with BGP Signaling

- BFER3/4/5/6 advertises its BIER prefix to BFR3/4/5/6, with its own BIER prefix as tunnel destination in TEA
- BFR3/4/5/6 re-advertises to X, changing the tunnel destination in TEA to its own BIER prefix
  - So that others will send traffic to BFR3/4/5 instead of to BFER3/4/56
  - BFR3/4/5/6 also advertises its own BIER prefixes so that others know what BIER label to use when sending traffic
- X re-advertises to BFRx, NOT changing the tunnel destination in TEA
  - So that BFRx will tunnel to BFR3/4/5/6 directly instead of to X
- X re-advertises to BFR1, changing the tunnel destination in TEA to BFRx’s BIER prefix
  - So that BFR1 will tunnel to BFRx instead of X
- BFRx advertises its own BIER prefix to X, setting the tunnel destination in TEA to its own BIER prefix
  - X re-advertises to BFR1, NOT changing the tunnel destination
  - This is so that BFR1 know what BIER label to use when tunneling to BFRx
- BFR1 re-advertises to BFIR1, changing tunnel destination to BFR1’s BIER prefix
- BFIR1 sends BFER3/4/5/6 traffic to BFR1 (tunnel destination address in TEA)
- BFR1 tunnels traffic to BFRx (tunnel destination address in TEA)
- BFRx tunnel traffic to BFR3/4/5/6 (tunnel destination in TEA)
Summary

• Tethering a BFR helper reduces the copies of tunneled packets over resource-scarce links

• Two options to make tethering easier
  • X pretends it supports BIER but label switches incoming BIER packets to its helper BFRx
    • Requires software upgrade on X and its helper only
    • Only works for MPLS
  • BFRx advertises it is X’s helper and others will tunnel over X
    • Upgrade needed on BFRs but not on X
    • *This is the preferred solution*

• Flexible tethering options
  • Stub/Transit helpers
  • One-for-many, many-for-one helpers
Next Steps

• Seek comments
• Request WG adoption