BFR Tethering

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How to handle BIER incapable routers?

• Get around them and/or tunnel through them
  • X in the below diagram does not support BIER

![Diagram showing BIER-capable routers BFR1, BFR2, BFR3, BFR4, BFR5, BFR6, with X indicating a router without BIER support.]

Source: Arial 12pt.
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

• Tunnels would need to be announced in IGP to make tethering work
  • Otherwise the Section 6.9 method would never put BRFx onto its SPF tree
  • They would need to be announced a BIER specific MT or use FlexAlgo
    • Don't want to send unicast traffic through BFRx

• Unless with the following trick:
  • 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
    • BFRx knows that X does not really support BIER
      • Through provisioning or additional signaling from X
    • X could also have other connections as long as the X-BFRx metric is 1
Additional Signaling

• X signals “BFRx is my helper”
  • BFRx will know X is actually not capable
  • Other BFRs may use Section 6.9 method to tunnel over X
    • Instead of relying on X to use BIER labels to switch to BIER packets to its helper

• Alternatively, BFRx signals “I am X’s helper”
Summary

• Tethering a BFR helper reduces the copies of tunneled packets over

• 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

• Next Steps
  • Seek comments
  • Request adoption after polishing