

BFR Tethering

draft-zzhang-bier-tether-02

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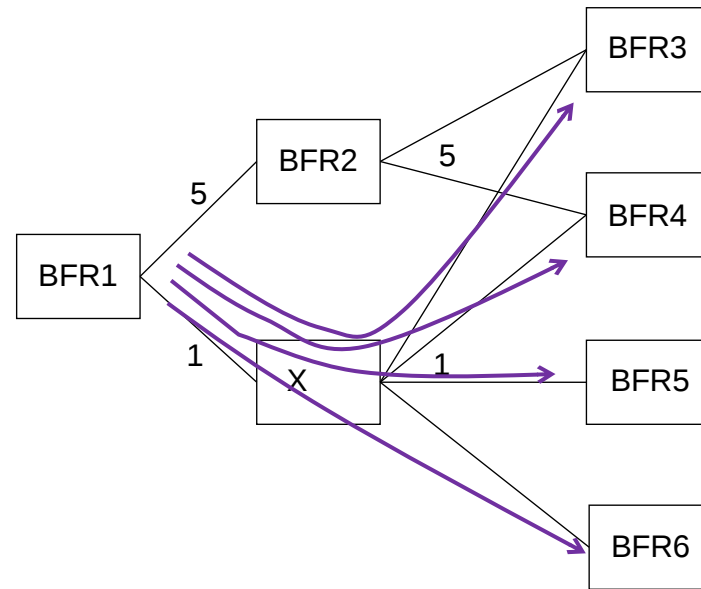
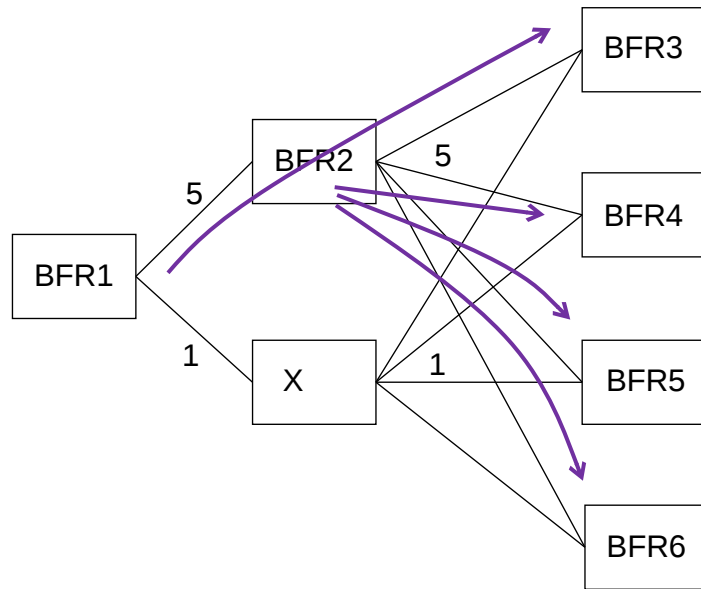
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Brownfield Deployment

How to handle BIER incapable routers?

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

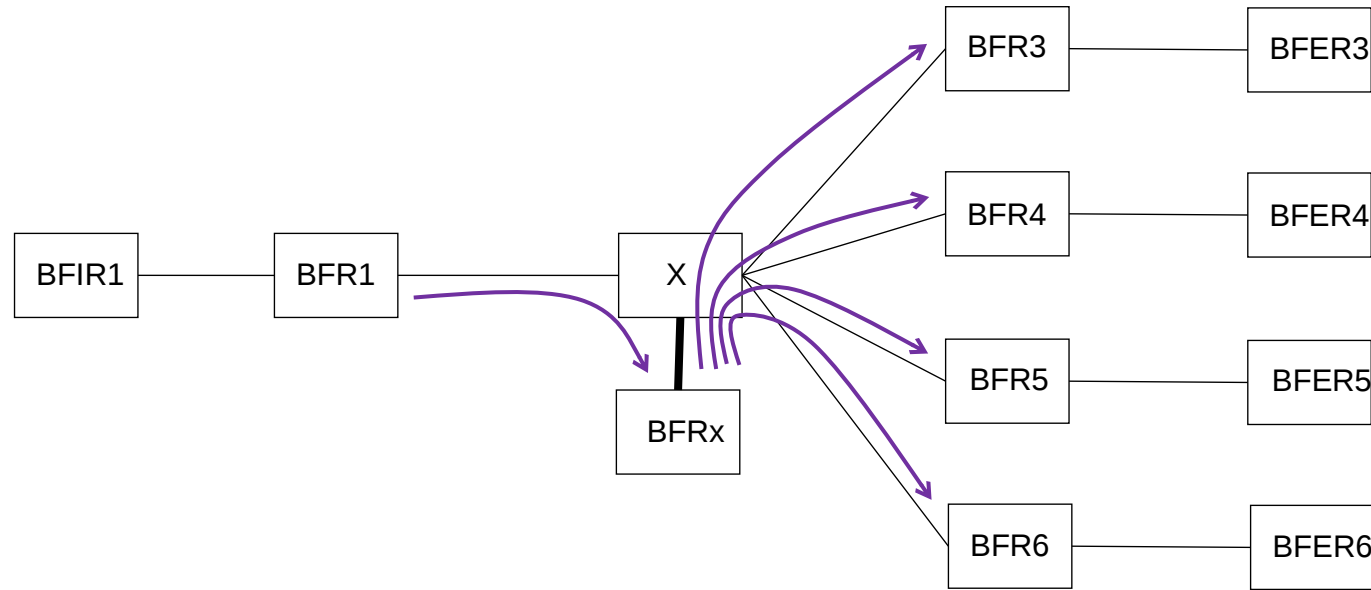


Tunnel Through Incapable Routers

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

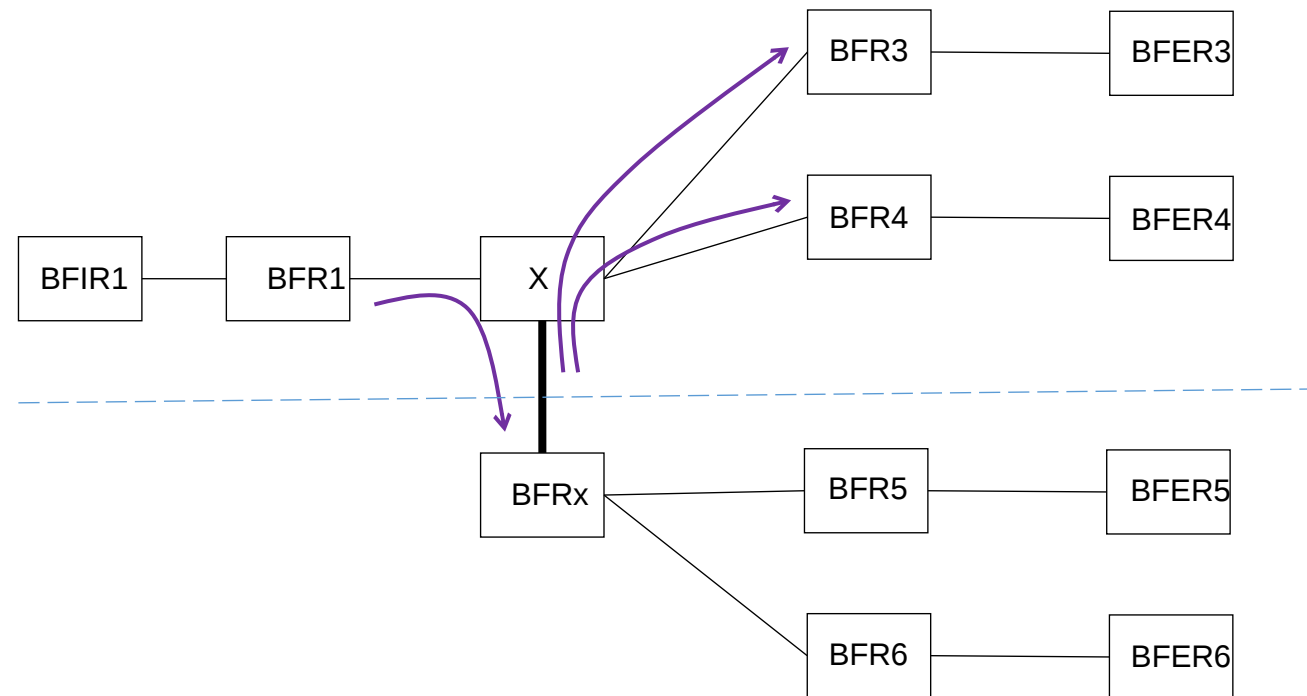
Re-using Existing BFRs as Helpers

- 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?

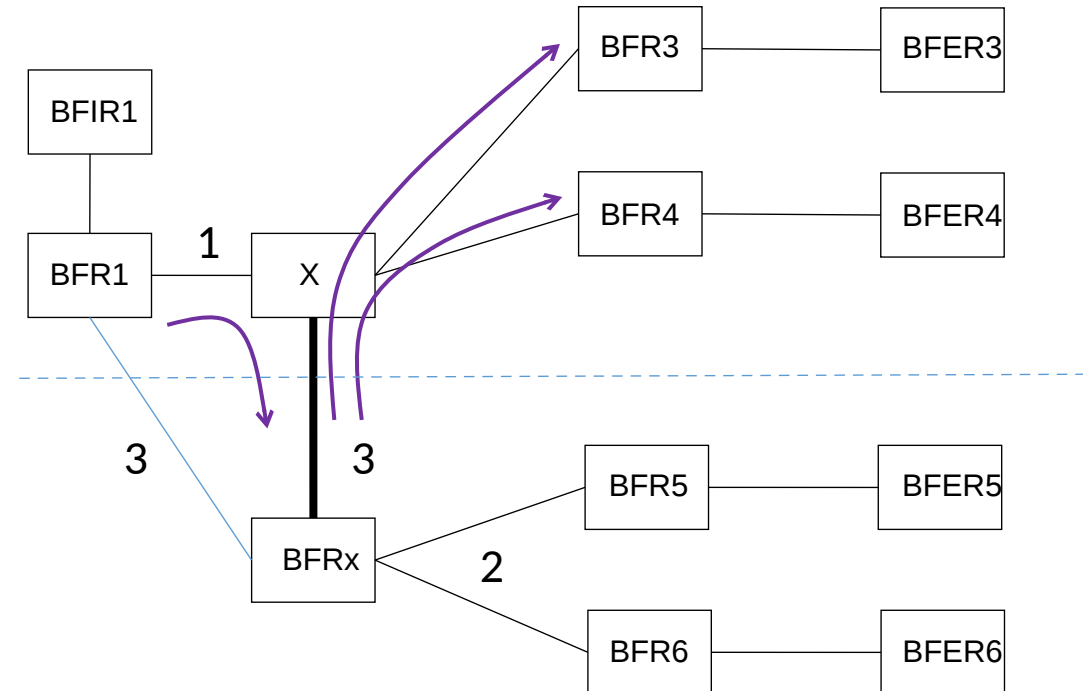
Stubby helpers will not cause loop

- A dedicated helper w/o any other connections
- A helper w/o (direct/indirect) connections back towards tunnel ingress



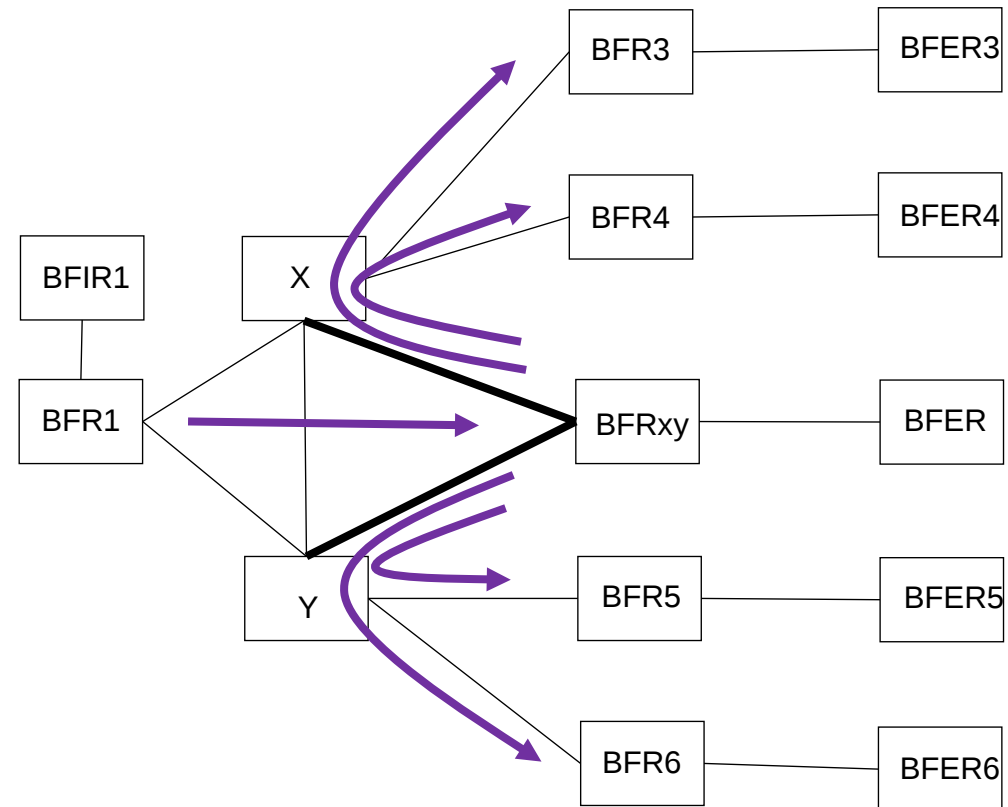
Looping Concerns: transit helpers?

- 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***



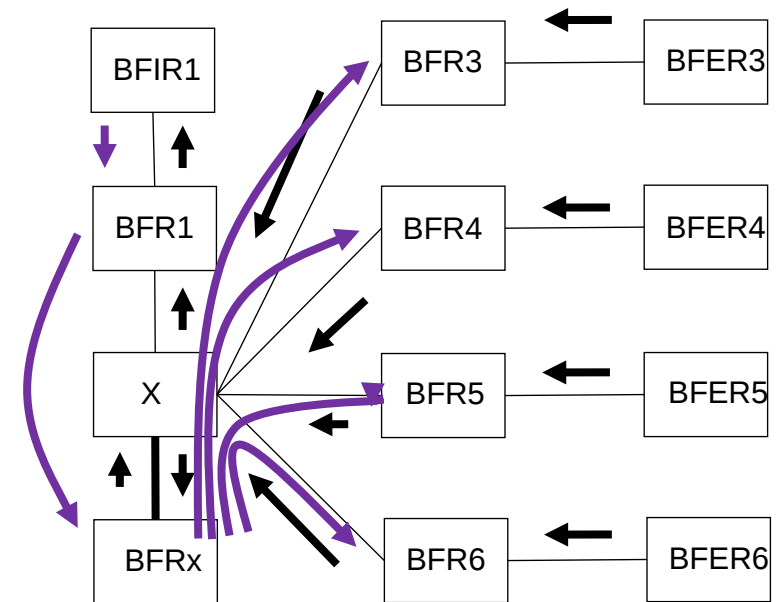
Looping Concerns: One Helper for Multiple Helped?

- 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 BFER3/4/5/6
 - 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)



BGP on each hop

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