Multicast blackhole mitigation with PIM adjacency conditions on routing announcements

draft-morin-mboned-mcast-blackhole-mitigation-00

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Context / Problem statement

Context
- Multicast more and more deployed
- Focus on multicast QoS / convergence

It can occur that the unicast routing advertises a link while the PIM-SM adjacency on a link is not ready yet, e.g.:
  - if PIM Hellos not exchanged yet
  - or if PIM is not configured on both sides (not yet, misconfig)
  - etc.

What happens:
- the SPF computed by unicast routing uses a link on which PIM is not ready
- PIM Joins propagate along this path...
- ...but fail at the router before that link...
- ...resulting in a traffic blackhole
(0) Initially, A and B receive multicast sent by multicast source S toward group address G.

(1) A link comes up, the IGP adjacency comes up, but PIM adjacency is not up.

(2) The IGP advertises the new link.

(3) SPF toward S is recomputed, PIM updates the RPF interface for S. PIM sends Prune(S,G) on old path and Join(S,G) on new path.

(4) Router fails to send PIM Join on link, because PIM is not up.

(5) Receiver A will not receive traffic from S, until the PIM adjacency comes up.
What RFC4601 says
- when a link comes up, wait [0-5s] before sending a Hello
- neighbor waits [0-5s] before sending a Hello in reply
- if need to send a Join to a neighbor and no Hello was sent yet on the interface, send a Hello now before sending the Joins

What is not discussed:
- nothing said about whether or not a router needs to have received from a neighbor before sending a Join
- might be done
- **but** Hellos carry options that are meant to be extended, and may impact how Joins are sent

Improvements
- improvements can be considered
- will help addressing the problem statement
Proposed approach

- We want minimal impact on unicast
  - raising a link cost before PIM is ready would have a significant impact on unicast

- A possible solution is to...
  - use a multi-topology IGP
  - make PIM follow the multicast-dedicated IGP topology
  - make the IGP use some “PIM adjacency ready” condition to advertise/not-advertise a link in the multicast topology

- Advantages
  - low impact on unicast routing
  - purely local behavior
  - no need to extend the IGP

- Criteria for advertising a link in the multicast topology
  - have PIM be configured on this link
  - having sent and received PIM Hellos on the link
  - neighbor not currently being in graceful restart operation
  - multiple options => ...more “intelligence” depending on implementations...
Generalisation

- Same problem happens with BGP:
  - a BGP neighbor advertise a route to a unicast source on a link where PIM is not ready yet

- The proposed approach can be generalized:
  - use non-congruent unicast routing
    - in an IGP: use multi-topology IGP (or multi-instance)
    - in the i/eBGP case: use SAFI 2 BGP routes
    - applicable to the context of multicast in a VPN
  - take into account the PIM status on a link to..
    - IGP case: advertise the link in the IGP
    - BGP case: accept/advertise BGP routes on this link
Next steps

■ Proposed approach is a local implementation matter
  • useful to document this practice
■ PIM Hello adjacency improvements
  • to be discussed
■ Feedback is welcome!

Questions ? Comments ?