Multipoint BFD overview and solution space

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Multipoint BFD Overview

- Verifies connectivity of head->tail multipoint path

- Technology independent (IP mcast, MPLS P2MP, etc.)

- Does not verify tail->head return path

- Does not verify unicast head->tail path

- Optional notification to head of tail status

- Protocol timing/scalability driven entirely from head

- Runs next to Classic Unicast BFD

- Falls out of existing Unicast BFD spec (pretty much)

Session Types

- Operation modeled as distinct session types:

  - **Point-To-Point**: Classic BFD

  - **Multipoint Head**: Session on head sending multipoint packets

  - **Multipoint Client**: Optional session on head tracking individual tail

  - **Multipoint Tail**: Session on tail tracking head

Original MP Service Definition

- Base function plus a number of options
- Options may be enabled in any combination

- **Base function: Unidirectional Transmission**
  - Head sends periodic packets along MP tree
    - based on the discriminator distributed and specific to the head
  - Tails detect BFD timeout, do "the right thing" (e.g. listen to another head)
  - Head ignorant of tails, no BFD packets sent to head
  - Simple, extremely scalable

Service Definition - option 1

- Option: **Solicit Membership**
  - Head sets Poll bit in MP transmission
  - Tails send unicast Final in reply
  - Tail transmission smeared across time specified by head
  - Head gets a Pretty Good idea of tails listening (unreliable)

Service Definition - option 2

- Option: **Tails notify head of session failure**
  - Head directs tails to send periodic packets to head when tail detects session failure
  - Upon session failure, tail sends bfd.DetectMult packets (smeared across time) and then quiesces
  - Semi-reliable (multiple packets are sent)

Service Definition - option 3

- Option: **Verify Connectivity of Specific Tail**

  - Head sends unicast Poll Sequence to specific tail (learned by solicitation or outside means)

  - Tail replies with Final (and without smear, so it's quick)

  - Head reliably learns tail state (if tail ever replies)

Service Definition - option 4

- Option: **Some Tails are More Equal Than Others**

    – Side effect of unicast Poll Sequence is that intervals carried therein override multipoint values

    – Head can thus raise transmission rate of individual tails for failure notification

Service Definition - option 5

- Option: **Silent Tails**
  - Tails may be provisioned to never reply to BFD even when head sends Polls
  - Allows for large numbers of second-class citizens in class-conscious tail population

Demultiplexing

- Multipoint (M) bit flags multipoint packets
- Packet demuxing rules select session
- Session type determines elements of procedure

Protocol Tricks and Hackery

- Multipoint packets all sent with Demand (D) bit set, **tails cannot send periodic packets while session is up**

- Required Min RX value set to zero means "no periodic transmission ever" (controls failure notification)

- Silent Tail = 1 means "no transmission ever" (no reply to polls)

Environmental Assumptions

- Tail needs to be able to differentiate between packets received on different MP trees if same head is going to be heard from on multiple trees
  - **Via discriminators specific to the head**
- Head is identified by source address

Next Steps

- Reminder M bit already exists in base spec – no need to revisit

- Could add use of p2mp procedures in p2p scenario?

- LSP-ping extensions needs to be fully addressed

  http://tools.ietf.org/html/draft-ietf-mpls-p2mp-lsp-ping-10

- We'll reissue in the next month
  - Current version:

  http://tools.ietf.org/html/draft-katz-ward-bfd-multipoint-02

- MIB work?