Multipoint BFD overview and solution space

David Ward
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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
  

• We’ll reissue in the next month
  – Current version:

• MIB work?