BIER-TE PREF&OAM

IETF101

draft-thubert-bier-replication-elimination-03

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Summary

• Candidate to support DetNet PREF + advanced OAM together with BIER-TE
  • Useful to any “high resilience” application with BIER-TE, not only DetNet
  • DetNet may? Also force stronger QoS parameters (bandwidth, jitter guarantees)
  • IPTV, Finance, other classical multicast:
    • Probabilistic as fast as possible is good enough. Does not have to be deterministic

• PREF – Packet Replication and Elimination Function
  • New ? Term for classical “live-live”, “dual-transmission” scheme
  • Packets with flow-id + sequence numbers sent across two disjoint paths
    • Receiver performs “duplicate elimination” – by flow/sequence-number
  • Used by IP multicast applications (video receivers) since ~ 2010 ?
    • Finance multicast application since ~1997
    • Feasibility of in-router-forwarding plane duplicate elimination proven in prototype
      • AFAIK, not shipping in L3 routers / NPU (software forwarding routers may exist)
      • TSN (L2 ethernet switches likely support this too already (asic based ?)
  • DetNet -> good opportunity to get standardized supported model?!
BIER-TE and PREF

• BIER-TE responsible/flexible for disjoint dual (or triple,...) path definition.
• PREF modelling (may discuss better during proposed header draft)
  • Enhanced BIER-TE header: include sequence number
  • Existing (BFIR-id, entropy) act as flow-id
  • BFIR app creates BIER-TE packet with sequence-number, flow-id
  • Any BFR configured for EF (Elimination Function) eliminates duplicates
    • IN INGRES, BEFORE REPLICATION (see next slide)
  • Current thinking!
    • Still considering if creation / recreation of sequence number or egres EF is beneficial/necessary (may take a while to understand all DetNet details)

• Linkage BIER-TE / PREF
  • BIER encap already includes BFIR-ID not required by BIER – only for overlay function (RPF for ecap'ed traffic)
  • BFIR-ID and entropy in BIER header can nicely/logically act as flow-id.
    Makes it very logical not to introduce another separate header for sequence-number
  • EF happening on ingres of BFR’s (not simple function outside of BIER domain)
EF example - ring

- Traffic from I1 via BIER-TE bitstring engineered to flow in both directions around the ring.

- Each BFER B3, B4, B5, B6 performs ingres EF and passes resulting packets on.

- Likely result
  - Copy1: I2->B1->B3->B4->B5
  - Copy2: ->B6->B5->B4

- Aka: ingres EF achieves maximum efficiency: will not have packets unnecessarily run fully twice around ring.
  Only to place where packet “meet”
  - Will have one segment (eg: B4<->B5) where both copies are sent across
  - Which one this is depends on delay across segments.
OAM function

• Enhanced function on top of OAM (optional ?!)
  • Examines received (remaining) bitstring, compares with known sender bitstring. Can identify which path packet has taken.
  • Can therefore provide resilience statistics
  • E.g.: in non-ring topologies (common in TSN), every BFIR will receive both copies.
    • OAM would show/account that both copies arrive etc.

• Mote details when Pascal can present (conflict with ROLL WG today)
Changes from -02

• Fixed bugs, added co-author
• More explanation / background (BIER-TE, DetNet)
• More details about EF
  • Defined BIER-TE forwarding model extension
    • ingress feature on BFR configured separately from existing BIER-TE rules
      • Details of EF behavior (automatic recognition of flow vs. explicit creation)
      • Would be nice if we could move these details off this draft in future when we find a common EF
definition in DetNet (unclear if/when that would happen)
      • Definition of EF behavior tries to align with existing non-EF DetNet EF defined so far.
    • Dependency against fitting header (flow-id/sequence number)
• Ring example with explanation
Applicability to BIER

• PREF could be applicable to BIER
• Encapsulation proposed to allow use of BIER / BIER-TE
• With BIER would need to use IGP dual topology path engineering.
• BIER option not fully worked out (yet)
• OAM functions also likely more limited in diagnostics (TBD)