Support for selective ordering/duplication preservation on 802.17 Ring

Bridging Adhoc

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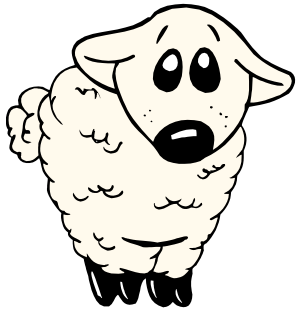

Introduction

- 802.1D Compliance requires no misordering/duplication across a bridged 802 network
  - Older legacy protocols fail when packets are duplicated or misordered.
  - Spanning Tree Protocol (STP) preserves the “No Misordering/Duplication Requirement” at the expense of restoration and topology convergence during failures (increased packet loss)

- Majority of newer protocols running today are more robust to packet duplication/misordering
  - IEEE development of Rapid Spanning Tree Protocol (802.1W) provides rapid network restoration (decreased packet loss) at the expense of introducing some duplicated/misordered packets during network convergence.

802 STP/RSTP/MSTP

- 802 Bridged networks can be configured for STP or RSTP depending on the misordering/duplication/packet loss requirements of the upper layer protocols

- Multiple Spanning Tree (802.1S) allows multiple STP or RSTP instances over a single 802 LAN or bridged network
  - Misordering/Duplication sensitive protocols are carried in VLANs managed using STP
  - Non sensitive protocols are carried in VLANs managed using RSTP

RPR Packet Duplication/Misordering Issues

- The RPR ring poses inherent packet duplication/misordering issues that need to be addressed by the 802.17 MAC
  - Ring Protection / Restoration Events
  - Topology Change Events

- BAH investigations of duplication/misordering scenarios is leading toward the following additional MAC requirements
  - Flushing requirements during protection/restoration
  - Additional consistency checks for all frames received by the MAC

RPR Packet Duplication/Misordering Issues

- While flushing and consistency checking addresses the duplication/misordering issues, these mechanisms affect packet loss and latency requirements.
  - Topology change causing one of the consistency checks to fail, results in all affected traffic being discarded until the new topology converges.
  - Flush requires the MAC to stop transmitting new traffic onto the ring, until the flush message circles the entire ring (max RTT). This value can be substantial on a large heavily loaded ring with large STBs.
  - Cessation of traffic during a flush may result in buffer overflow (traffic loss), or traffic not meeting its delay requirements (also traffic loss).
  - Some scenarios may result in packet loss exceeding the RPR 50ms protection requirements.

Solution

- Define a bit in the RPR header that indicates duplication/misordering sensitive traffic (no_dup_misorder)
  - Frames having the bit set go through the more rigorous set of frame validation checks. Frames with the bit set are tossed during scenarios that might lead to duplication/misordering.
  - Frames having the bit set are tossed by the MAC during a protection event until the restore completes.
  - Frames not having the bit set are allowed to pass on the ring.

Solution – cont'd 2

- Duplication/misordering sensitive traffic should not penalize packet loss requirements of other traffic on the ring
  - Dup/mis sensitive traffic is very small percentage of total traffic on the ring
  - Proposal of having a dup/misorder mode on the ring, is if there is only one flow carrying dup/mis sensitive traffic, it impacts the restoration robustness for all other traffic on the ring.
  - Review of this issue with 802 said it was acceptable to trade packet loss robustness for duplication/misordering

Solution – cont'd 3

- Setting of this bit may either be done by passing as a parameter from the MAC client to the MAC or set by the MAC
  - MAC client indicates the no-misorder/dup parameter based on whether the associated VLAN is in an STP or RSTP group
  - MAC can set the no_dup_misorder bit based on a VLAN configuration table which is configured through the LME.
  - MAC can be configured to set the no_dup_misorder bit for all traffic received from the MAC client. (marking all traffic transmitted by a given station is still better than affecting traffic sourced by all stations on the ring)

Conclusion

- Define a bit in the RPR header to support marking of duplication/misordering sensitive traffic.
  - Satisfy 802.1D/802.1Q compliance with minimal complexity
- Selective Duplication Misordering can be used in any of the 3 duplication/misordering proposals (DVJ, MH, MT)
- May potentially be used to simplify the above 3 proposals.
  - For example, frames marked dup/misorder can be discarded under a protection or link status event until the new topology converges as an alternative to some of the error checking suggested above. Unmarked frames would not require any of the proposed rules or checking described above. Further investigation required.