Wrapping and Steering Co-existence

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Why Support Both

- There are solid engineering reasons for implementing either wrapping or steering
  - a tradeoff on packet loss, system complexity
  - consensus may not exist for a single version
- Define standard such that either can be implemented
  - No issue in a homogeneous ring
  - Need to have proper mechanisms to allow wrapping and steering nodes to co-exist

Wrapping Requirements

- **RPR Header requires:**
  - WrapBit
    - indicates that the packet has been wrapped and is on the opposite ringlet
    - Initially 0 the value is inverted when the packet is wrapped
  - SteerBit
    - Indicates that the packet was sourced from a SteeringNode and it should not be wrapped but stripped at a wrap point

- **the 256 node limit requires special handling of TTL decrement**
  - Only decrement TTL when WrapBit is clear and the ring state is wrapped
    - This prevents a packet from circulating forever when unwrapping occurs

Steering Requirements

- Multi-cast packets must be sent on both ringlets
  - TTL must be set differently per ringlet {N,M}
    - Such that N+M = NumberOfNodesOnRing
    - Guarantees no packet duplication on restoration
    - If a node is lost, N or M must be changed quickly or duplication will occur

- Unknown Uni-cast must be treated exactly like multi-cast
  - Additional complexity in bridging

Heterogeneous Operation

- Three possible designs
  - Steering Nodes implement Wrap (SWIS)
    - Wrap only used when in a ring with wrapping nodes
  - Wrapping Nodes Steer
  - Wrapping Nodes Wrap, Steering Nodes Steer
    - Wrapping nodes may have to steer depending on location of failure
      - If between two wrapping nodes – system can wrap
      - Else system must steer

- Assumes Topology is used to determine homogeneity
- Assumes Protection signaling is multi-cast for quick protection

Steering Nodes Wrap

- Steering Nodes implement a Wrap path for packets from Wrapping nodes

  - Wrap a packet if the SteerBit is clear

- Wrapping Nodes drop packets with the SteerBit set

- Simple HW for Dual Ringlet MACs

Wrapping Nodes Steer

- No requirement for a Steer Bit
- Requires that the Wrapping nodes provide
  - multi-cast replication hardware
  - dual initial TTL values
  - unknown uni-cast gets treated as a multi-cast

Wrapping Nodes Wrap, Steering Nodes Steer

- All requirements of previous two approaches
  - "worst" of all worlds

Conclusion

- The standard should support a mechanism that allows vendors to implement either wrapping or steering

    – Allows vendors to target the box to their customer requirements

    – Allows interoperability in the case of heterogeneous rings