Signaling Convergence Proposal: Forward Path Probing

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Objective #1 : Find a commonality in all proposals

- Forward path probing: present in all 4 proposals
  - Proposed in FECN [Dallas'06]
  - ECM has used it in early BCN ("solicit" bit)
  - E2CM and 3-point QCN have it

- Backward path probing: proposed by M. Seaman [Monterey'07]
  - Destination-initiated, moving upstream in 'reverse' path

- **Path probing** is the one common feature found in all proposals

- Why?
  1. No need for CPIDs and tags
  2. Provides consistent picture of the whole path, w/ local and global status
     1. Gathers local feedback from all switches along path
     2. Enables measurement of path occupancy
  3. NIC-driven sampling: Big potential for optimization (adaptive sampling)
  4. No constraint on feedback type or source response function
  5. Can be applied to <u>all</u> schemes without changing their nature.

Objective #2 : Simplify signaling

- Reduce the number of signaling options

  1. Forward
     + Simple: follows the traffic flow
     + Aggregates e2e feedback: conveys global status (both + and – feedback)
     + No reverse-path injection in switch
     - RX-NIC must reflect: already does it for ACKs
     -   Longer lag compared to direct backward signaling
         -   Worst-case lag = RTT, which implies hotspot close to source: not critical
         -   Lag for critical hotspot close to destination is about the same
     - Open loop if link fails: ditto in reverse / backward case
     - Multipath ambiguation: similar to rate limiter aggregation

  2. Backward
     + Less lag: fastest response
     - Local: non-coherent feedback w/ heterogeneous switches
     - Complex: down/up-stream intercoupling in switch -> reverse injection is tough

  Forward is simpler, backward is faster... which one is more suitable?

Forward Path Probing: Lowest Hanging Fruit?

- Path probing is a natural match with forward signaling
  - Direct BCN alone is mutually exclusive w/ path probing

- Simpler protocol
  - Controllable overhead and complexity

- Lower entry barrier to congestion-managed networks
  - Reduces the burden on switch vendors

- OPEN
  - Enables arbitrary type of feedback and source response function
  - Allows alternate signaling options