Problem Statement and Requirements for a More Accurate ECN Feedback

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Problem Statement

- **Explicit Congestion Notification (ECN)**
  - Network nodes can mark IP packets instead of dropping them
  - ECN-capable receiver feeds this information back to the sender

- **Problem**
  - More accurate ECN feedback needed for new TCP mechanisms (like Congestion Exposure (ConEx) or Data center (DCTCP))
  - ECN in TCP can only feed back one congestion signal per Round-Trip Time (RTT)
  - In contrast:
    - *The extent of loss is fed back in TCP/SACK and other transport protocols (SCTP, DCCP, RTP/UDP etc)*
    - *ECN for other transport protocols, such as RTP/UDP and SCTP, is specified with more accurate ECN feedback*

Overview

- **Use Cases**
  - A sender with standardized TCP congestion control that supports ConEx
  - A sender using DCTCP without ConEx
  - A sender using DCTCP and supporting ConEx
  - As-yet-unspecified sender mechanisms **[new]**
  - A RFC5681 TCP sender without ConEx
  - Using CE for checking integrity

- **Requirements** (next slide)

- **Design Approaches**
  - Re-Definition of ECN/NS Header Bits **[re-written]**
  - Using Other Header Bits
  - Using a TCP Option

Requirements

- **Resilience**
  - to delayed or lost ACKs
- **Timeliness**
  - of feedback within one RTT
- **Integrity**
  - to misbehaving receivers or network nodes
- **Accuracy** [more detailed new]
  - of feedback with more than one congestion notification per RTT
  - by reconstructing number of bytes and order of all four code points (non-ECT, CE, ECT(0), ECT(1))
- **Complexity**
  - by minimum state information
- **Overhead**
  - minimal in each segment and no additional segments
- **Backward and forward compatibility**
  - by negotiation and fallback to classic ECN
  - to traverse most existing middleboxes

Updates -04 to -05

- Comments by Michael Scharf addressed

- Added Bob Briscoe as author

- Additional use case on as-yet-unspecified sender mechanisms
    - … that respond to the extent of congestion feedback

- Recommendation (in accuracy requirement) to avoid bias if feedback is not reliable
    - →Thanks for off-list feedback to Mohammad Alizadeh!

- Design approach on re-defining the ECN/NS header bits re-written
    - … and now distinguishes between re-use of single bits or using all bits as one codepoint

- Appendix on ambiguity of the more accurate ECN feedback in DCTCP

Next

- Start WGLC?

- Updates on protocol drafts planned
  - draft-kuehlewind-tcpm-accurate-ecn-02
    - →Adapt mechanism to better reflect ETC(1)
  - draft-kuehlewind-tcpm-accurate-ecn-option-01
    - →Feedback needed!