ECN SUPPORT IN QUIC

draft-johansson-quic-ecn-03
Ingemar Johansson
ECN = Explicit Congestion Notification
Makes it possible for congested nodes to mark instead of discard packets
Look for instance in RFC3168 for more info
ECN is a key component in L4S
draft-briscoe-tsvwg-l4s-arch, draft-ietf-tsvwg-ecn-experimentation
Objective: Get ECN support in QUIC already from beginning
  – Implement necessary support for ECN
  – Congestion control based on ECN is separate work
  – Not a given that this draft becomes a WG item

Feedback from: Marcelo Bagnulo Braun, Michael Welzl, Mirja Kühlewind, Niklas Widell, Koen De Schepper, Piers O’Hanlon, Brian Trammell, Bob Briscoe..
OUTLINE OF DRAFT-JOHANSSON-QUIC-ECN

› QUIC specific:
  – ECN negotiation (or ECN capability sensing)
    › Performed after connection setup (at least for now)
  – ECN feedback: In ACK frames
  – Monitoring

› More general:
  – Fallback in case of ECN failure
  – OS sockets specifics
Takes place after connection setup → avoid that ECN failures delay connection setup
  - No matter how unlikely this is…
  - Generalized ECN (bagnulo..) → ECN Negotiation already at connection setup possible?

Implemented as a 2 octet ECN negotiation frame

Both peers send ECN negotiation frame and echoes the ECN negotiation frame
  - ECN in one direction possible in some cases

IP header ECN bits are set to ‘11’ when ECN negotiation frames are transmitted
  - Or should it be ECT(0) or ECT(1)?

<table>
<thead>
<tr>
<th>0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
</tr>
<tr>
<td>C</td>
</tr>
</tbody>
</table>

- C: Challenge bit, indicates that the transmitted ECN negotiation frame is a challenge, if bit is not set then it is a response.
- R: Possible to read ECN bits in IP header
- W: Possible to write ECN bits in IP header
- EE: Echo of ECN bits
- U: Unused
<table>
<thead>
<tr>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

- Included in ACK frame
- E0, E1 and CE fields indicate encoding length of ECT(0), ECT(1) and CE marked bytes
  - 00: 0 bits
  - 01: 16 bits
  - 10: 32 bits
  - 11: 48 bits
- Min overhead = 1 octet
- Possible to report ECN even though ECN is not negotiated
- How are bytes counted (recovery draft is silent on this)?
  - QUIC
  - QUIC + UDP?
  - QUIC + UDP + IP?

ECN support in QUIC | Public | © Ericsson AB 2017 | 2017-07-16 | Page 5
OTHER

› Monitoring
  – Useful for indication of paths that do not implement ECN support correctly
  – Details T.B.D

› ECN fault detection and fallback
  – Details T.B.D but earlier work exists

› OS socket specifics
  – Document OS socket specifics i.e. access to ECN bits in IP header from user space
WAY FORWARD

› Add ECN negotiation and ECN echo to draft-ietf-quic-transport
› Add ECN (classic) handling to draft-ietf-quic-recovery

› L4S handling ?
  – Add specific details or placeholder ?
COMMENTS WELCOME

› email :
ingemar.s.johansson@ericsson.com