Accurate ECN Feedback for TCP (AccECN)
draft-ietf-tcpm-accurate-ecn

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TCPM WG, IETF-116, Mar 2023
TCP Congestion Feedback

Background & Problem

• DCTCP, L4S etc. repurpose standard ECN [RFC3168]
  • which "marks" more packets in the IP header (v4 & v6), the greater the queue.
• Sender keeps delay v low by adjusting rate in response to extent of marks
  • reported via end-to-end transport layer feedback

• Works fine with feedback in modern transports like QUIC or DCCP [RFC9000, RFC4340]
• ...but TCP was only designed to feed back existence not extent of congestion
  • sufficient when ECN was added back in 2001 [RFC3168]
Accurate ECN TCP feedback – recap
draft-ietf-tcpm-accurate-ecn

- AccECN reuses the 3 ECN flags in the main TCP header (ACE)
  - 3-bit counter to feed back number of IP-ECN marks
  - also to negotiate support by both TCP ends during the handshake

- AccECN TCP Option optionally adds wider counters that rarely wrap

<table>
<thead>
<tr>
<th>Port no’s, Seq no’s…</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Offset</td>
</tr>
<tr>
<td>Checksum</td>
</tr>
</tbody>
</table>

TCP Options…

AccECN Option, length: min 2B, typical 5-8B, max 11B
TCP Options…
Recent changes (Nov'22 → Feb'23)

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• Unclear areas found during Apple implementation:
  • Use handshake encoding also for pure ACK of any retransmitted SYN/ACK
  • detection and response to pure ACK loss due to the AccECN TCP Option
    (symptom would be continual retransmissions)

• Fixed "idnits" and some other minor editorial issues
Recent changes 1/2 (Feb'23 → Mar'23)

WG last call 7 Mar – 24 Mar 2023

- Review from Michael Tüxen: all resolved – largely editorial
  [archive 8 Mar 23]
  - additionally defined position of TCP header flags using same bit offset terminology as IANA
  - specified big-endian for option counters and LSB for the ACE field
  - s/IP header/TCP header/ (whoops!)
  - Clarified requests to IANA; asked for the ExID assignments to refer to the RFC-to-be

- Editorial issue from Alex Burr resolved
  - two occurrences of 'experiment' missed [github issue #4]
Recent changes 2/2 (Feb'23 → Mar'23)

• Review from Gorry – all editorial [archive 25-26 Mar]
  • Checking 'actor' in each req't: Data Sender, Data Receiver, host, TCP Client, TCP Server, 'it'
  • Promote §3.3 on requirements for Proxies, Offload & Other Middleboxes to §4?
  • Numerous other useful improvements

• Review from Markku [archive 26 Mar]
  • Describe how IANA would allocate remaining bit combinations?
  • Forward compatibility: only treat all other combinations of 3 header flags as AccECN... if not otherwise understood
  • ACKs of pure ACK: only relevant to ECN++ draft (EXP) so shift this text there?
AccECN Implementations

- Linux (v5.15)
- FreeBSD (except AccECN TCP Options)
- Apple OSs (in progress)
Next Steps

- draft-ietf-tcpm-accurate-ecn-23 → 24
  - in progress
  - to address all the WGLC reviews
- Thank you