QUIC Accurate
ECN
Acknowledgments

Marten Seemann, Vidhi Goel
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RFC 9000: Acknowledging ECN

- ECN counts are cumulative for the packet number space
- It is not possible to deduce ECN code-points received for each packet, esp. which packets were not CE-marked.
- Knowing above helps in accurately increasing cwnd during congestion avoidance and avoid excessive queue build up.

```
ACK Frame {
    Type (i) = 0x02..0x03,
    Largest Acknowledged (i),
    ACK Delay (i),
    ACK Range Count (i),
    First ACK Range (i),
    ACK Range (. .) . . . ,
    [ECN Counts (. . )],
}

ACK Range {
    Gap (i),
    ACK Range Length (i),
}

ECN Counts {
    ECT0 Count (i),
    ECT1 Count (i),
    ECN-CE Count (i),
}
More Accurate ECN Feedback?

Congestion controllers like Prague, BBRv3 would benefit from knowing:

1. The size of packets that were not CE-marked
2. Which packet number was CE-marked

Idea: define a new ACCURATE_ACK_ECN frame

- include the ECN code-point in the ACK Range encoding

ACK Range {
  Gap (i),
  ACK Range Length (i),
  ECN Marking (8),
}