Ack Frequency

draft-ietf-quic-ack-frequency

https://github.com/quicwg/ack-frequency

QUIC WG, San Francisco, July 2023

Frame Formats in -05

```
ACK_FREQUENCY Frame {
     Type (i) = 0xaf,
     Sequence Number (i),
     Ack-Eliciting Threshold (i),
     Request Max Ack Delay (i),
     Reordering Threshold (i)
}
```

```
IMMEDIATE_ACK Frame {
     Type (i) = 0xac
}
```

Sequence Number: Allows receivers to ignore obsolete frames after reordering.

Ack-Eliciting Threshold: The maximum number of ack-eliciting packets the recipient of this frame can receive before sending an acknowledgment.

Request Max Ack Delay: The value to which the endpoint requests the peer update its max_ack_delay

Reordering Threshold: An 8-bit field representing an unsigned integer that indicates how out of order packets can arrive before eliciting an immediate ACK. 0 indicates the peer should ignore reordering.

Recent changes since -04 are quite small

- New Error code for invalid Request Max Ack Delay (#179)
- PMTU MAY (not SHOULD) use IMMEDIATE_ACK (#192)
- Remove a redundant MUST (#166)
- Remove a SHOULD upon migration (#189)

Open Issues

One or two byte frametype? (#181)

IMMEDIATE_ACK is likely to be sent often (#119), so the WG decided to use a 1 byte frametype, but ACK_FREQUENCY less often.

Question: Should we change to a 2-byte codepoint?

New Paths and Migration? (#205)

- Should ACK_FREQUENCY frames be per path?
  - What about NAT rebinds, which one peer may not be aware of?
- Should ACK_FREQUENCY be a probing frame?
  - Allows endpoints to bundle an ACK_FREQUENCY frame with the PATH_CHALLENGE / PATH_RESPONSE frame

Proposal: Define a new version of the frame for multipath

Add recommendation to send IMMEDIATE_ACK soon after app-limited period? (#209)

May be inline with RFC7661.

If only need one ACK per RTT, could send for 2 RTTs w/out receiving an ACK.

Options

- Do nothing
- Editorial
- RECOMMENDED

Redux: Is One ACK per RTT enough? (#168)

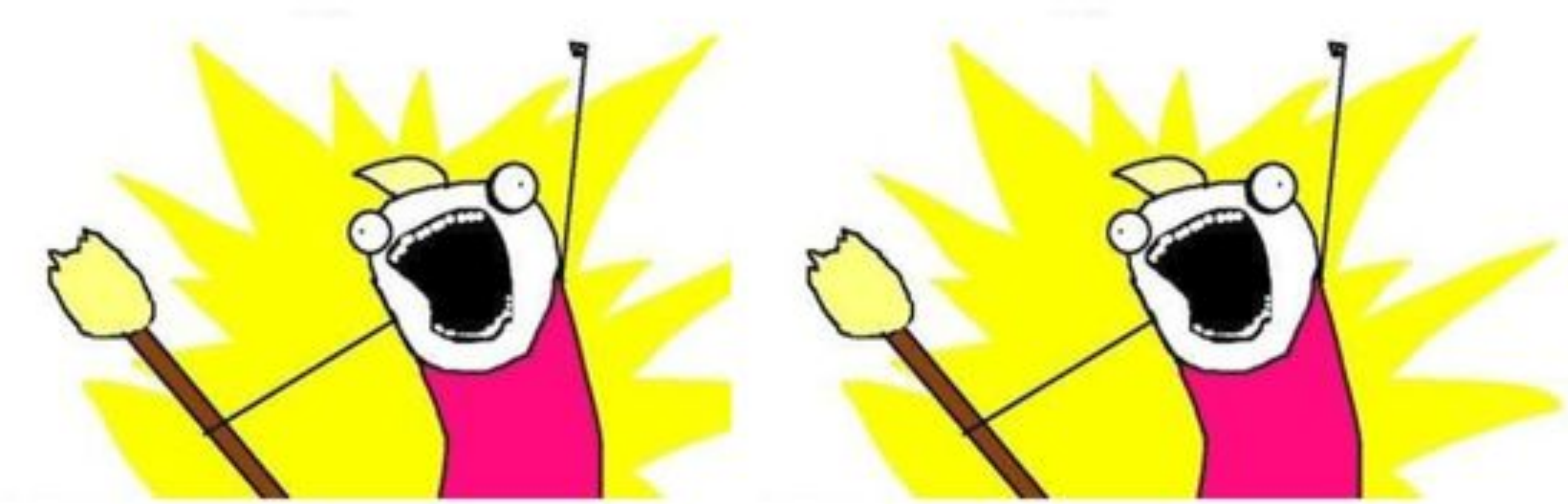
Current text:

… a sender SHOULD cause a receiver to send an acknowledgement at least once per RTT if there are unacknowledged ack-eliciting packets in flight.

- If `min_ack_delay` > RTT, this can be tricky
- Proposal is to change it to 2, but 3 or 4 are typically better

Options: Do nothing, update to 2, drop normative text, add a RECOMMENDED value of 4, ?

Deployment Experience!



Facebook production experience

Mvfst default policy: ACK every 10 or SRTT/4 or reordering

- Implemented ACK_FREQUENCY controlled by CCA.
  - ACK every 10, windowed MinRTT/4
- Motivated by QUIC feature with “expected” reordering
  - Set reordering threshold to 100
- Small but significant and persistent regressions, even with small reordering threshold

Takeaways

- You **NEED** to PTO with IMMEDIATE_ACK if you mess with reordering. (#214)
- Be careful with MinRTT (#215), SRTT/4 is “good enough”.
  - Weird cases with tiny MinRTTs causing ACK spam.
- Reordering threshold ACKing not that useful?
- ACK_FREQUENCY works!