



Ack Frequency

[draft-ietf-quic-ack-frequency](https://github.com/quicwg/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?

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

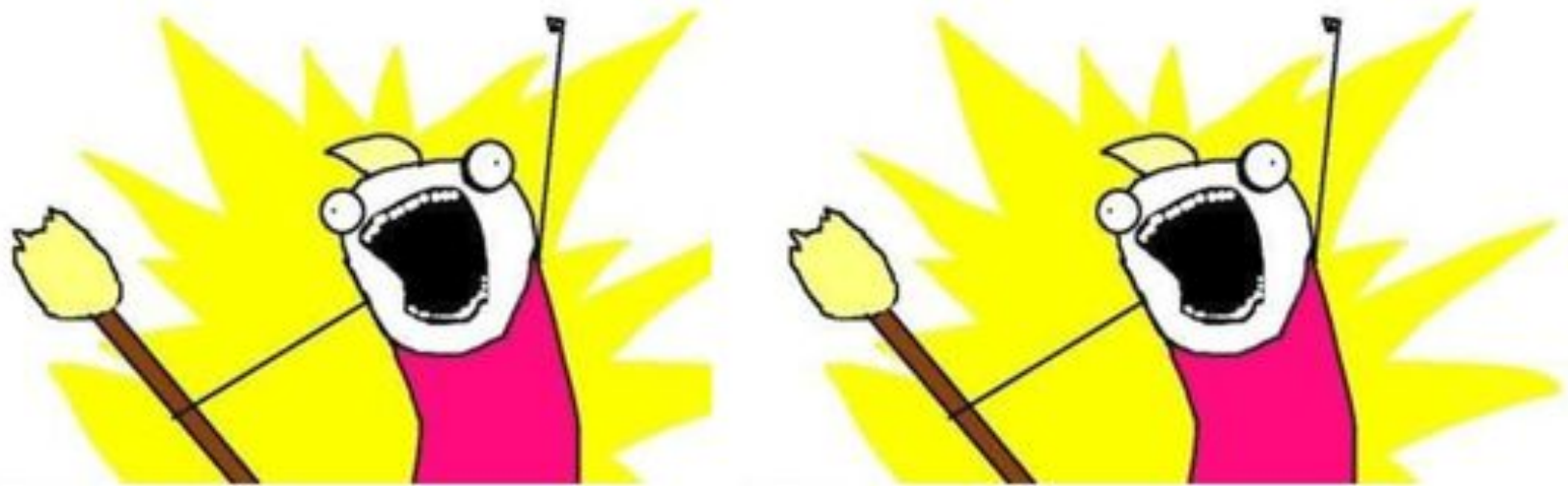
May be inline with RFC7661.

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

Options

- Do nothing
- Editorial
- RECOMMENDED

Deployment Experience!



Meta 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!

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

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 $\text{min_ack_delay} > \text{RTT}$, 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, ?