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SHORT-PAPER

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3638036.3640280.pdf
22 January 2026
Total Citations: 2
Total Downloads: 701

Published: 11 February 2024

Citation in BibTeX format

MHV '24: Mile-High Video Conference
February 11 - 14, 2024
CO, Denver, USA

Conference Sponsors:
SIGMM

https://doi.org/10.1145/3638036.3640280
ISBN: 9798400704932

This is The Way: Prioritization in Media-over-QUIC Transport

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ABSTRACT

Media-over-QUIC transport is a new application-layer protocol currently under development for low-latency media ingest and distribution. Used in both browser (*i.e.*, HTTP/3 WebTransport) and non-browser (*i.e.*, raw QUIC) environments, the solution targets various applications, including live streaming, cloud gaming, remote desktop, videoconferencing and eSports. This study investigates the potential benefits of QUIC's stream prioritization features.

CCS CONCEPTS

• **Networks** → **Application layer protocols**; • **Information systems** → *Multimedia streaming*.

KEYWORDS

MOQ, low latency, live streaming, rate adaptation.

ACM Reference Format:
Zafer Gurel, Tugce Erkilic Civelek and Ali C. Begen. 2024. This is The Way: Prioritization in Media-over-QUIC Transport. In *Mile-High Video Conference (MHV '24), February 11–14, 2024, Denver, CO, USA.* ACM, New York, NY, USA, 2 pages. https://doi.org/10.1145/3638036.3640280

OVERVIEW

In 2022, the Internet Engineering Task Force (IETF) formed a working group called Media over QUIC (MOQ) to study how the QUIC protocol (RFC 9000) could be used for latency-sensitive media transport [5]. Earlier, we tested one of the initial MOQ implementations and did a gap analysis [2, 4]. Based on the initial findings, potential enhancements were discussed, and prioritization emerged as an essential feature yet to be explored [2]. Later, we published the first prioritization results in a MOQ environment in [3].

Media over QUIC Transport (MOQT) [1] is currently under active development in the IETF. MOQT can be used to implement efficient prioritization techniques for various applications. For example, for low-latency live streaming, I and P-frames can be prioritized over B-frames, whereas for a non-low-latency live streaming use case, higher-resolution frames can be prioritized over lower-resolution ones. The current MOQT draft [1] has two prioritization proposals: send order and ordering with priorities.

In this study, we explore and compare the following two schemes:

Implicit Prioritization (FEFS): A single unidirectional QUIC stream is used to deliver the frames in the encoded order as shown in Figure 1. This is also known as First Encode, First Send (FEFS). When there is not enough bandwidth to send the encoded media, a latency increase may occur, as illustrated on the right in Figure 1.

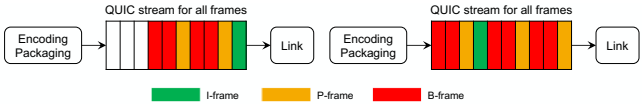

Figure 1: Illustration of implicit prioritization without (left) and with (right) congestion.

Prioritization by Frame Type (FT): A separate unidirectional QUIC stream is created for each frame type (*i.e.*, I, P and B) as shown in Figure 2, and based on the type, each stream is assigned a priority. I and B-frames have the highest and lowest priority, respectively.

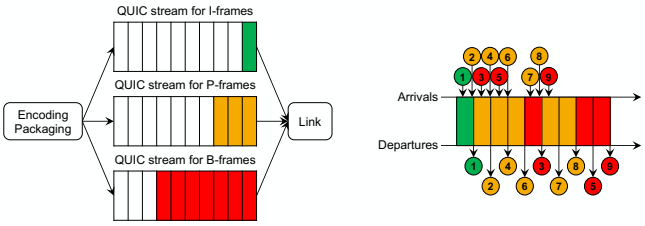

Figure 2: Illustration of prioritization by frame type.

Latency variation or on-time-display ratio (OTDR) can be examined to evaluate different prioritization schemes. OTDR represents the ratio of frames displayed on time over the total frames. Figure 3 shows the OTDR results for different bandwidth limitations under a latency budget of up to 3000 ms. The solid lines depict the results for frame type prioritization (FT), while the dashed lines depict them for implicit prioritization (FEFS). We observe that MOQT enables us to achieve a better quality-latency tradeoff at lower latencies through prioritization. This results in a better user experience or more equitable resource utilization.

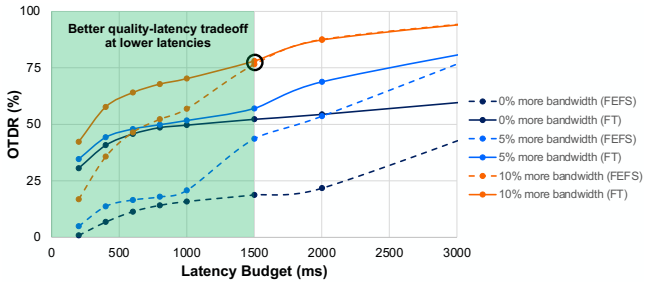

Figure 3: OTDR with FEFS and FT prioritization schemes.

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MHV '24, February 11–14, 2024, Denver, CO, USA
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ACM ISBN 979-8-4007-0493-2/24/02.
https://doi.org/10.1145/3638036.3640280

REFERENCES

[1] L. Curley, K. Pugin, S. Nandakumar, and V. Vasiliev. Media over QUIC transport. [Online] Available: https://datatracker.ietf.org/doc/draft-lcurley-moq-transport/. Accessed on Jan. 17, 2024.

[2] Z. Gurel, T. E. Civelek, and A. C. Begen. Need for low latency: Media over QUIC. In *ACM MHV*, 2023 (DOI: 10.1145/3588444.3591033).

[3] Z. Gurel, T. E. Civelek, A. C. Begen, and A. Giladi. A fresh look at live sports streaming with prioritized media-over-QUIC transport. In *Int. Broadcasting Convention Conf. (IBC)*, 2023. [Online] Available: https://www.ibc.org/technical-papers/ibc2023-tech-papers-a-fresh-look-at-live-sports-streaming-with-prioritized-media-over-quic-transport/10264.article. Accessed on Jan. 17, 2024.

[4] Z. Gurel, T. E. Civelek, A. Bodur, S. Bilgin, D. Yeniceri, and A. C. Begen. Media over QUIC: Initial testing, findings and results. In *ACM MMSys*, 2023 (DOI: 10.1145/3587819.3593937).

[5] IETF. Media Over QUIC (moq). [Online] Available: https://datatracker.ietf.org/wg/moq/about/. Accessed on Jan. 17, 2024.