Cross-layer metrics sharing for QUICker video streaming

Joris Herbots Maarten Wijnants Wim Lamotte Peter Quax
{first}.{last}@uhasselt.be

Problem Statement

Contrary to expectations, preliminary experimentation of HTTP adaptive streaming (HAS) over QUIC shows little improvement over TCP. We argue that this is because:

- HAS Adaptive BitRate (ABR) algorithms are specialized towards TCP
- Existing work is prone to miscalibrated QUIC implementations which provokes misleading conclusions

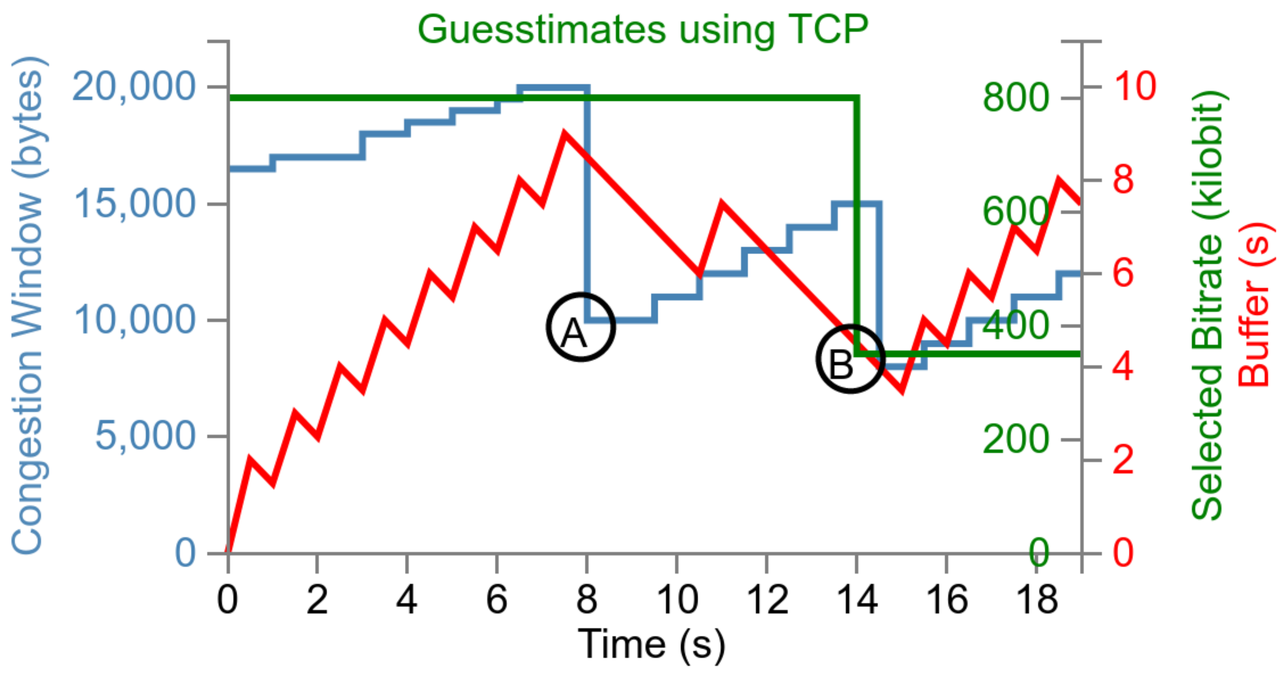
Application Layer Logic

A hypothetical visualization of a HAS client encountering congestion (A). Contemporary HAS ABR algorithms guesstimate transport layer metrics. Lack of exact insight into transport layer metrics results in the application-layer bitrate change (B) happening long after the transport layer conditions have changed.

Methodology

To tackle above problems, we will:

1. Log internal HAS states with qlog[1]
2. Visualize[2] QUIC transport parameters and HAS states on top of each other
3. Gather traces from different deployment scenarios
4. Holistically tune QUIC and ABR performance parameters

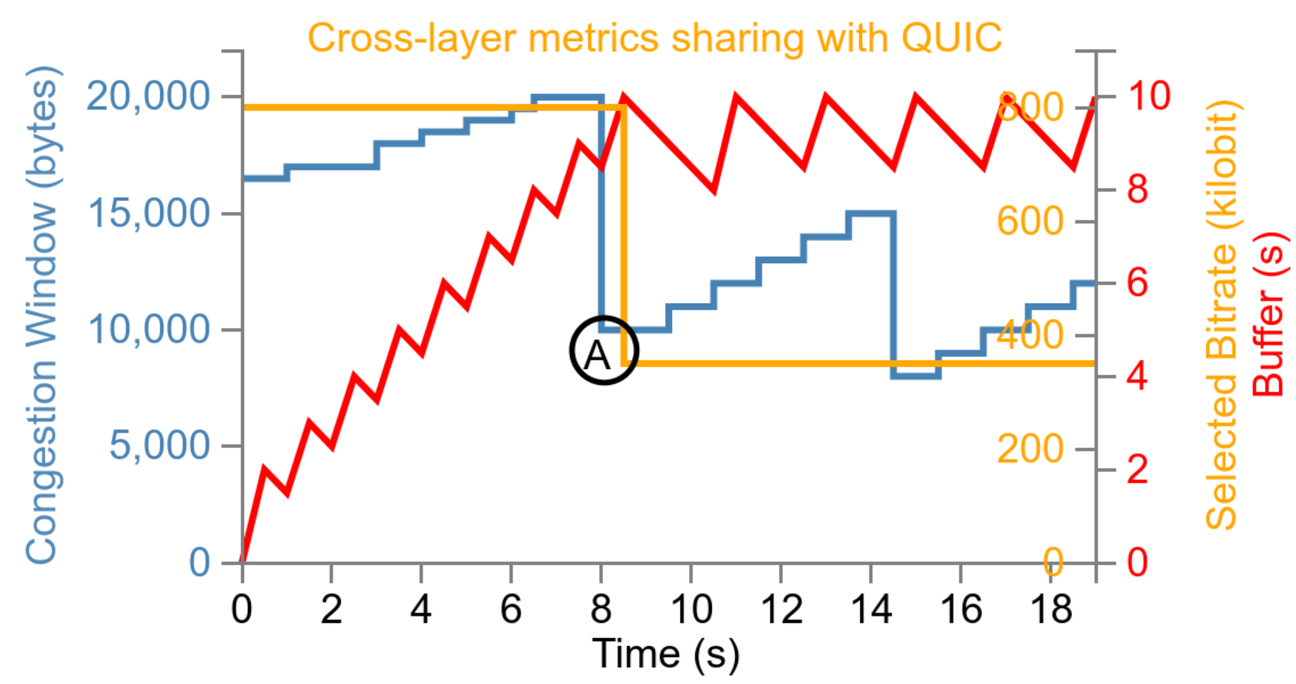


Transport Layer Improvements

Sharing transport layer metrics allows informing the ABR logic directly (A) of network changes, allowing for better informed decision-making.

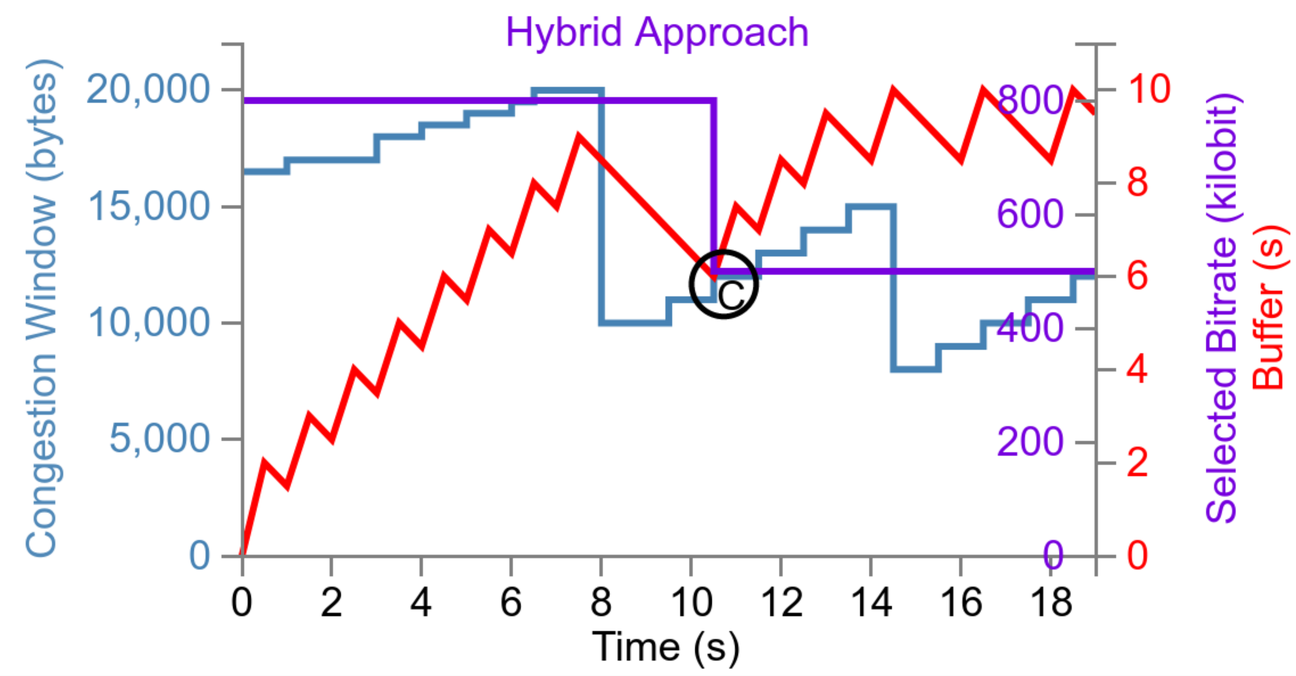
Research Directions

- What are interesting transport- and application-layer metrics?
- Explore interesting use-cases
  - Hybrid ABR approaches (see below)
  - Livestreaming
  - Low-latency streaming
  - Unreliable streams
  - Multipath QUIC



Hybrid Approach

By supplying contemporary ABR algorithms with more accurate metrics, we can engineer a hybrid approach (C), ultimately resulting in a sufficiently stable buffer and better QoE.



UHASSELT
KNOWLEDGE IN ACTION

1. https://tools.ietf.org/html/draft-marx-qlog-main-schema
2. https://qvis.edm.uhasselt.be