



QUIC Congestion Control Analysis

Abstract:

QUIC is a secure general-purpose, encrypted, multiplexed, and low-latency transport protocol designed from the ground up to improve transport performance for HTTPS traffic. QUIC has recently (May 2021) become RFC standard (RFC 9000) and is expected to become the dominant transport protocol in the Internet over TCP. QUIC has many features that were designed to overcome TCP's drawbacks.

QUIC advantages over TCP (From Prof. Reuven Cohen's lecture notes):

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QUIC main advantages over TCP

1. Built-in security
2. Protocol can rapidly evolve
3. Multiplexing many data streams over the same connection without head-of-line blocking
4. Reduced connection establishment latency
5. Improved loss recovery and congestion control
6. Connection migration (e.g., move from Wifi to cellular)

```
graph TD
    subgraph HTTP2_Stack [HTTP/2 Stack]
        H2[HTTP/2] --- T1[TLS] --- T1 --- TCP[TCP]
    end
    subgraph HTTPoverQUIC_Stack [HTTP over QUIC Stack]
        H2Q[HTTP over QUIC] --- Q[QUIC] --- T13[TLS 1.3] --- UDP[UDP]
    end
    IP[IP] --- TCP
    IP --- UDP
```

■ Note: "HTTP over QUIC" is different from HTTP2

Future plans

- Forward error correction
- MultiPath support
 - ◆ e.g. split the traffic between Wifi and cellular interfaces

Reuven Cohen Internet networking

Further information can be found in the IETF workgroup page: <https://quicwg.org/>

Purpose of the Project:

In QUIC the sender may unilaterally choose several congestion control algorithms. The purpose of this project is to install one of the existing QUIC implementations, implement a QUIC client-server connection, chose KPIs (Key Performance Indicators) of one of the congestion control mechanisms and analyze the mechanism.



What will be done in this project?

1. Install a QUIC Chromium client and server infrastructure on lab virtual machines.
2. Install QUIC monitoring tools: QVIZ, QLOG
3. Demonstrate in details the performance of one QUIC congestion control algorithm by defining KPI (Key Performance Indicators) and measure them in several scenarios.
4. Bonus: Demonstrate different congestion control mechanism and compare to the first (in section 3).

General requirements for all LCCN Projects are specified at the lab website:

<https://lccn.cs.technion.ac.il/lab-courses/>

Prerequisites:

1. Introduction to computer networks (236334)
2. Internet Networking (236341)

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