Security Analysis the QUIC Protocol

Abstract

The QUIC protocol [1] is a secure and encrypted transport protocol, characterized by multiplexing and low-latency capabilities. Its primary goal is to enhance the performance of HTTPS traffic. Recently standardized as RFC 9000, QUIC is poised to supplant TCP as the dominant transport protocol on the internet. The present research project entails an analysis of QUIC, focusing on cybersecurity. The investigation will employ open-source implementations of the protocol.

Project objective

1. Examine the resiliency of the QUIC protocol to cyber attacks.

Project overview

1. Review literature.
    a. Deep understanding of the QUIC protocol.
    b. Understand common network attacks.
2. Define Key Performance Indicators (KPIs) and the tests setup accordingly.
3. Ramp-up QUIC client and server.
4. Analyze the security of QUIC.
    a. Deep understanding of security properties and features of QUIC.
    b. Understand known network attacks against QUIC.
5. Implement network attacks of choice.
6. Write project report, final presentation and a poster for the project.

Project Milestones

1. 02.04.2023 – CDR
    a. Theoretical Review: Paper overview (see [2] and Section 21 in [1]).
    b. QUIC implementations review
    Describe the available QUIC implementations and choose the most suitable implementation for this project.
    c. Workplan for the rest of the semester
        i. Goals
        ii. Schedule
2. 03.07.2023 Final Presentation
    a. PowerPoint Presentation (In person)
    b. Final Report – Draft
    c. Project Poster – Draft

3. 20.07.2023
    a. Final Report
    b. Project Poster

Notes

1. The above list is an estimate. Goals and tasks may be modified during the first few weeks of the semester.
2. 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) – Mandatory.
2. Network Security (236350) – Advantage.

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References

[1] Iyengar, Jana, and Martin Thomson. "QUIC: A UDP-Based Multiplexed and Secure Transport." RFC 9000, May 2021.

[2] Chatzoglou, Efstratios, et al. "Revisiting QUIC attacks: A comprehensive review on QUIC security and a hands-on study." International Journal of Information Security (2022): 1-19.