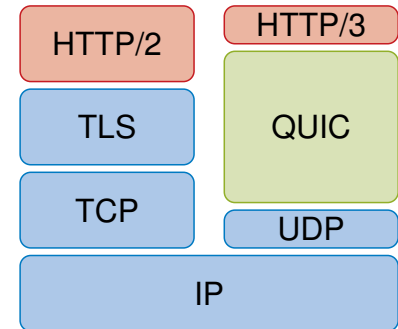**Thesis B.Sc.**

Thesis M.Sc.

IDP, Guided Research

Packet Pacing with the QUIC Protocol

Motivation

QUIC is a protocol developed by Google [1] and is the designated successor of the TCP / TLS stack. It is implemented on top of UDP and improves several issues with TCP and is currently standardized by the IETF [2]. QUIC allows low latency handshakes, gets rid of head-of-line blocking, enables fast development and allows switching IP addresses within one connection.

Since QUIC is implemented in user space

it is lacking several optimizations within the kernel which are utilized for example by TCP. One of these optimizations is *packet pacing*. To prevent queueing in the network packets are sent out with a given pace instead of a bulk. Additionally, TCP usually is ACK-clocked, which means that it reacts to incoming acknowledgements. However, QUIC cannot rely on these features. The goal of this thesis is to survey how different QUIC implementations (since there is no standard currently, there exist quite a bunch) tackle these issues.

[1] A. Langley, A. Riddoch, A. Wilk, A. Vicente, C. Krasic, D. Zhang, F. Yang, F. Kouranov, I. Swett, J. Iyengar, *et al.*, "The quic transport protocol: Design and internet-scale deployment," in *Proceedings of the Conference of the ACM Special Interest Group on Data Communication*, pp. 183–196, 2017.

[2] "IETF QUIC Working Group (quic)." https://datatracker.ietf.org/wg/quic/documents/. Accessed: 2020-05-20.

Requirements

- Knowledge about basic networking protocols (IP, TCP, UDP)
- Recommended: rough understanding of the QUIC protocol
- Experience with working on Linux and via `ssh`

Your Task

- Understand how pacing is achieved with TCP
- Survey different QUIC implementations and select some for benchmarking
- Deploy a mesurement setup in our hardware testbed
- Evaluate how packet pacing differs between TCP and the different QUIC implementations
- Topic can be extended for a Master's Thesis

Contact

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