Packet Pacing with the QUIC Protocol

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.


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

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

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