Java Implementation Of QUIC Transport Protocol

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January 16, 2018

Abstract

With the rapid growth of web based application and mobile revolution in recent years the main deciding factor for user experience is low latency. Most of the current internet traffic uses Transmission Control Protocol(TCP) with Transport Layer Security(TLS) which provides security for the traffic and HTTP2 which reduces latency. The above protocols results in high latency as TCP takes 3 Round Trip Time(RTT) for connection establishment followed by TLS handshake which takes 2 RTT. Further HTTP2 suffers from head of line blocking even though it reduces latency. HTTP2 uses multiple streams in a single TCP connection to send data, when there is a packet loss in a connection, all the other streams are blocked until the lost packet is re-transmitted. This introduces additional delay in the traffic.

Quick UDP Internet Connections(QUIC) which runs on top of User Datagram Protocol(UDP) is a new transport protocol developed to overcome delay and also provide security to the data traffic. It provides 0-RTT for connection establishment and 1-RTT for first time connection. It also solves the head of line blocking issue which HTTP2 suffers by sending multiple frames of the same or different streams in one QUIC packet. Loss of one packet impacts only those streams that were in that packet. QUIC also makes connection migration easier as the connection is identified by a 64 bit connection ID where as in TCP it is identified by combination of clients and servers IP address, port number and underlying transport protocol. If there is a change in the clients IP address then the existing connection is lost. QUIC is implemented in user space not in kernel space. Therefore it makes deployment easier.

This master thesis is about implementing QUIC in java to facilitate dessemination of content directly between devices. Now a days mobile devices are one of the major producers of contents like images, videos, facebook/ instagram posts. These are fisrt uploaded to the servers and then redistributed to other users even though they are within the wireless communication range. The idea of this thesis is to use the developed QUIC protocol for communication between these mobile devices.