

Omnidirectional Adaptive Bitrate Media Delivery using MPTCP/ QUIC over an SDN Architecture

HAYES, Brian; CHANG, Yusun; RILEY, George. Omnidirectional adaptive bitrate media delivery using mptcp/quic over an sdn architecture. In: *GLOBECOM 2017-2017 IEEE Global Communications Conference*. IEEE, 2017. p. 1-6.

MP-TCP

RFC 6824

Multipath TCP

January 2013

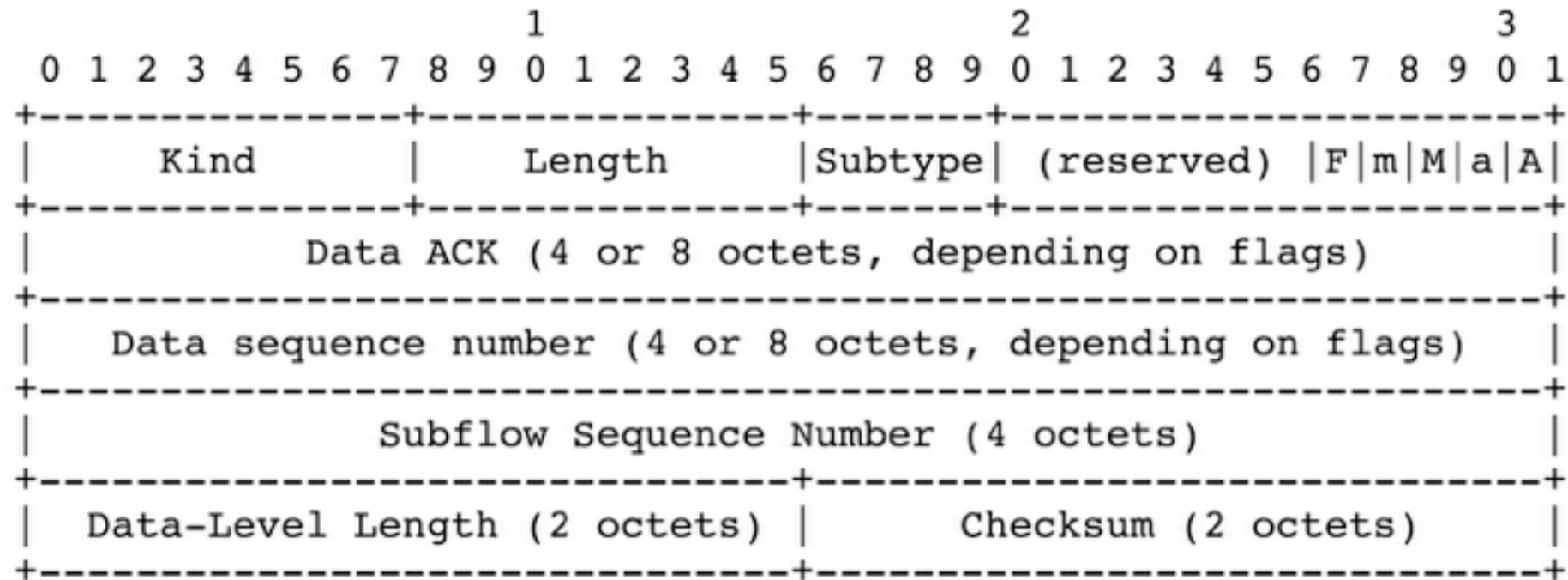
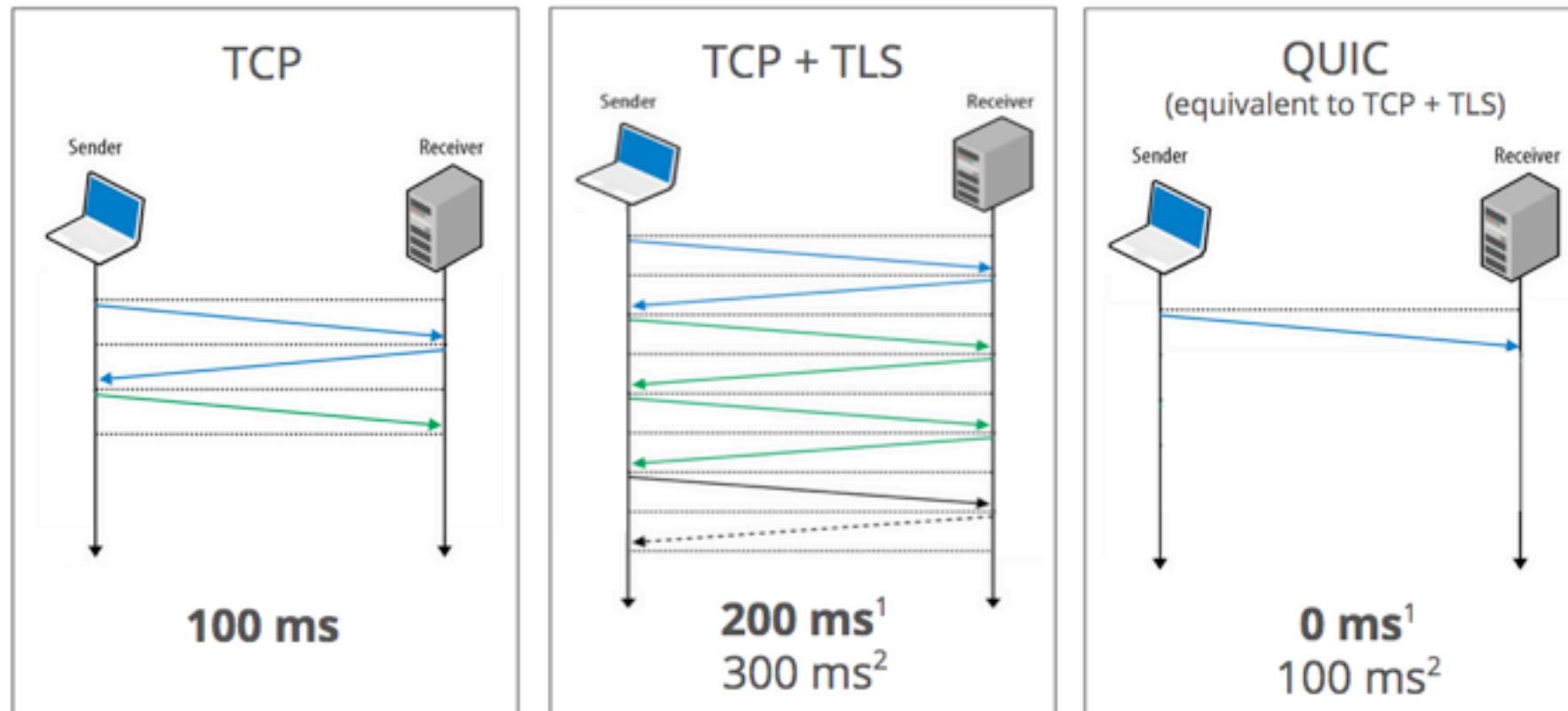


Figure 9: Data Sequence Signal (DSS) Option

- Large reorder buffer in lower bandwidth

QUIC

Zero RTT Connection Establishment



1. Repeat connection
2. Never talked to server before

- Reduce 60% delay in lossy network
- Result in 30% less buffering

Architecture

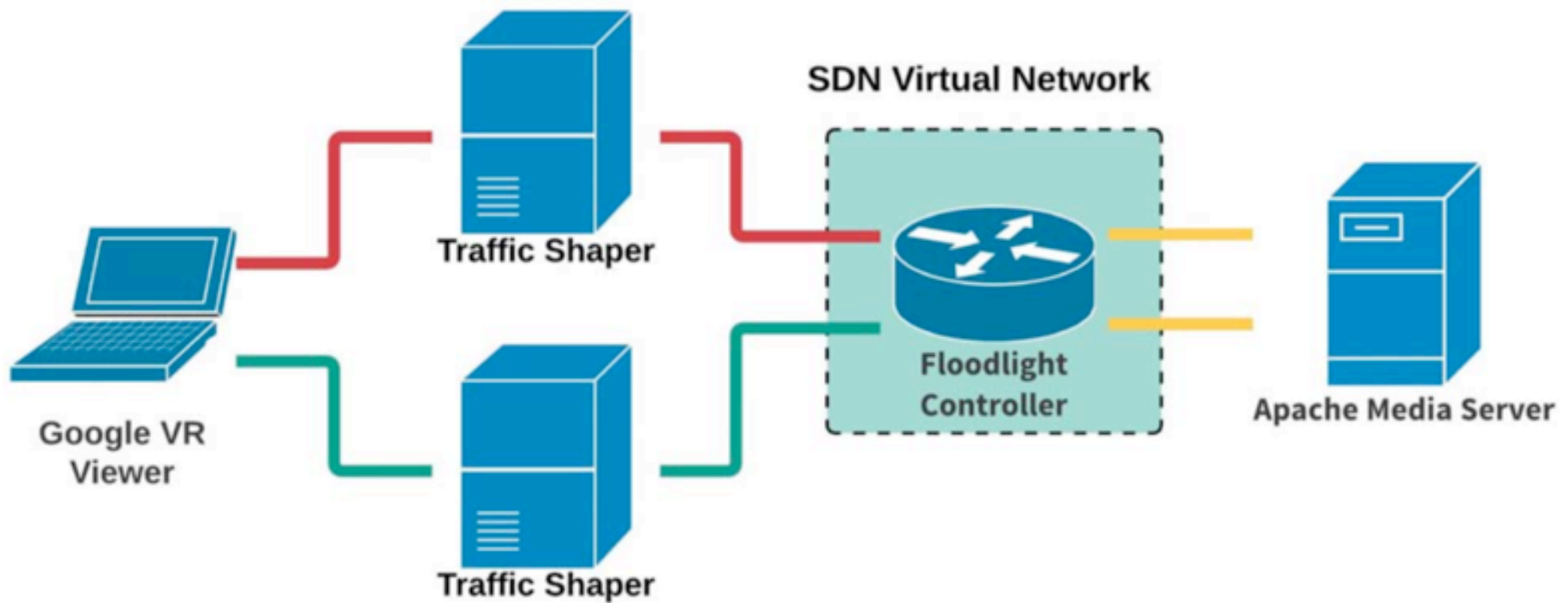
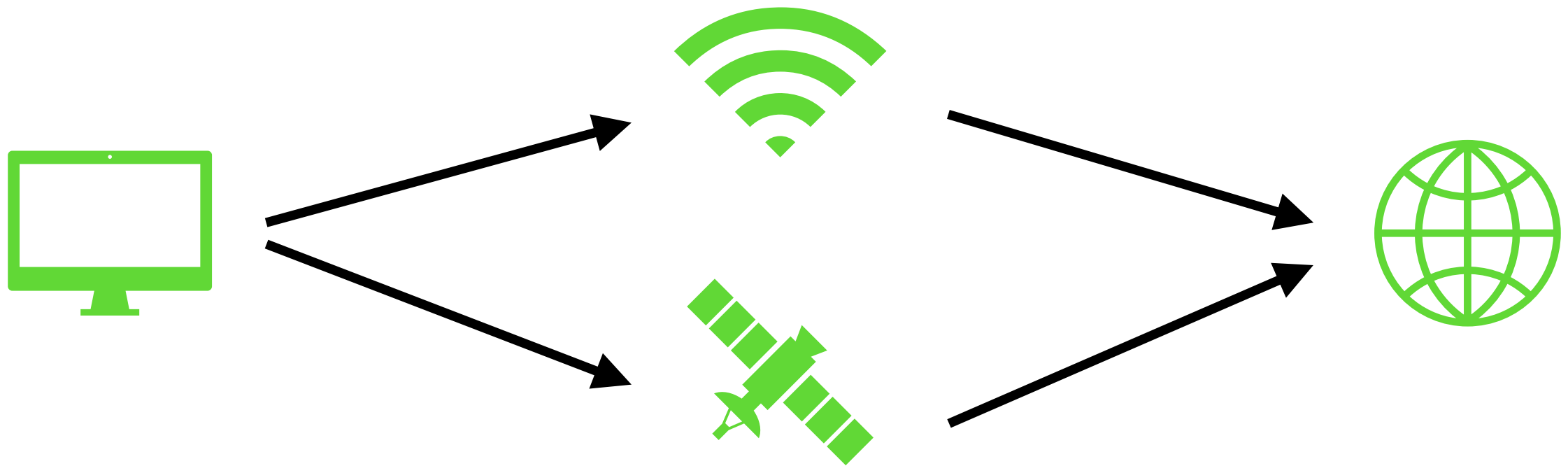


Fig. 4: Experimental lab testbed setup

Start-up Decision



Use QUIC



Compare the avg. RTT

Start-up Decision

if *numSubFlows* > 2 **then**

using *rttList* if any path $\Delta rttList > rttThres$
remove path using SDN if two or more paths
remain use MPTCP otherwise use QUIC on
lowest RTT

Reson: MP-TCP performs worse than TCP in unbalanced network.

Playback Network Monitoring

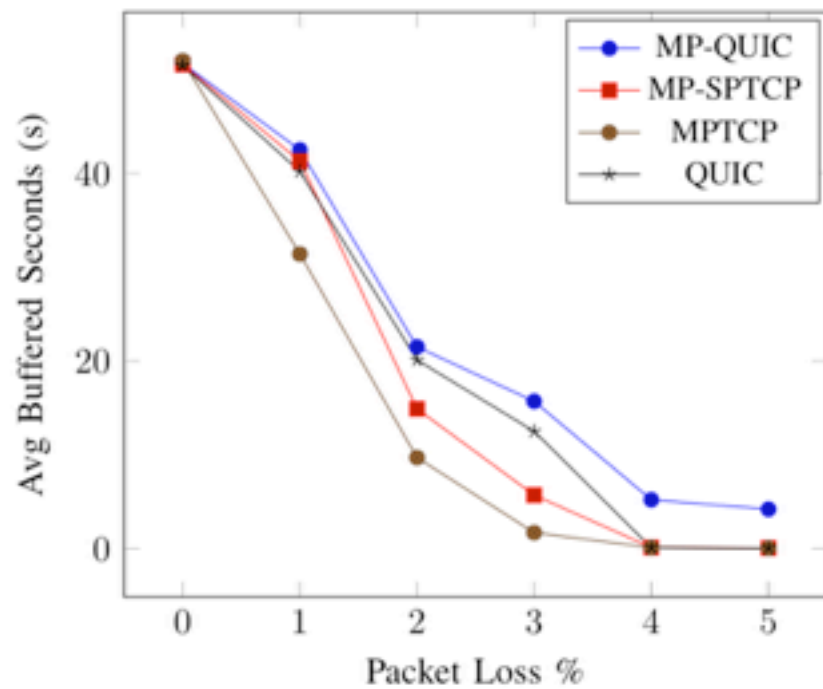
- Problem: MPTCP experiences is the potential for a high number of retransmissions and duplicate ACKs in unbalanced networks.
- Solution:

Connection in Progress:

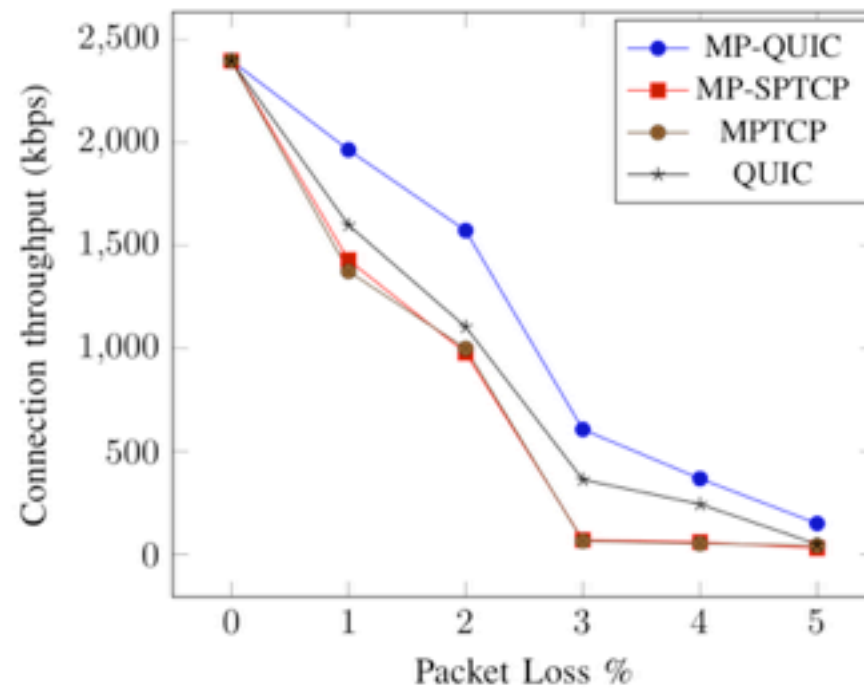
while *numSubFlows* > 0 **do**

monitor retransmissions and avg RTT on each path if any pass *rttThres* or *retransThres* remove the path unless there is only one remaining, in that case restart the connection with QUIC protocol

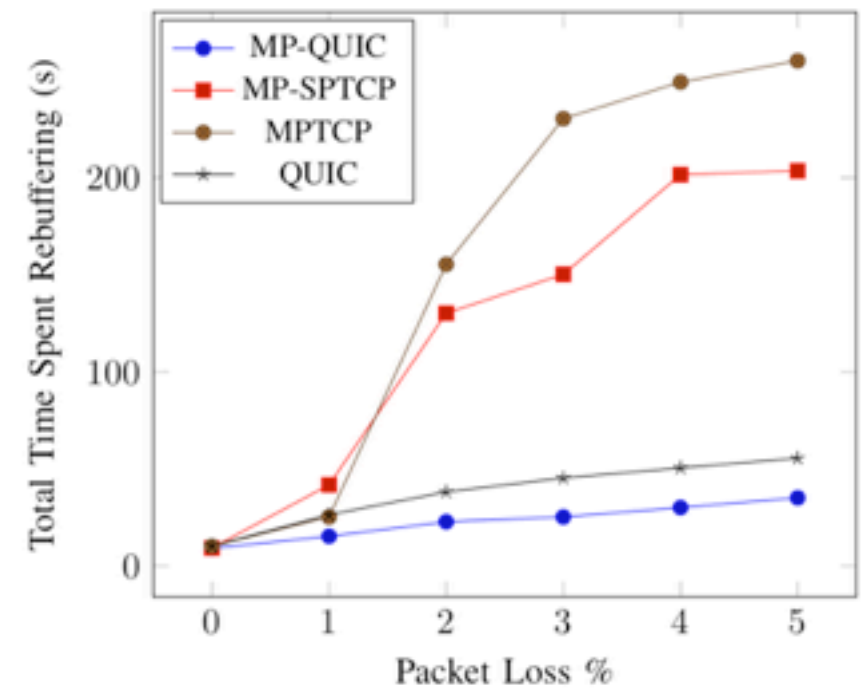
Evaluation



(a) Average buffer size

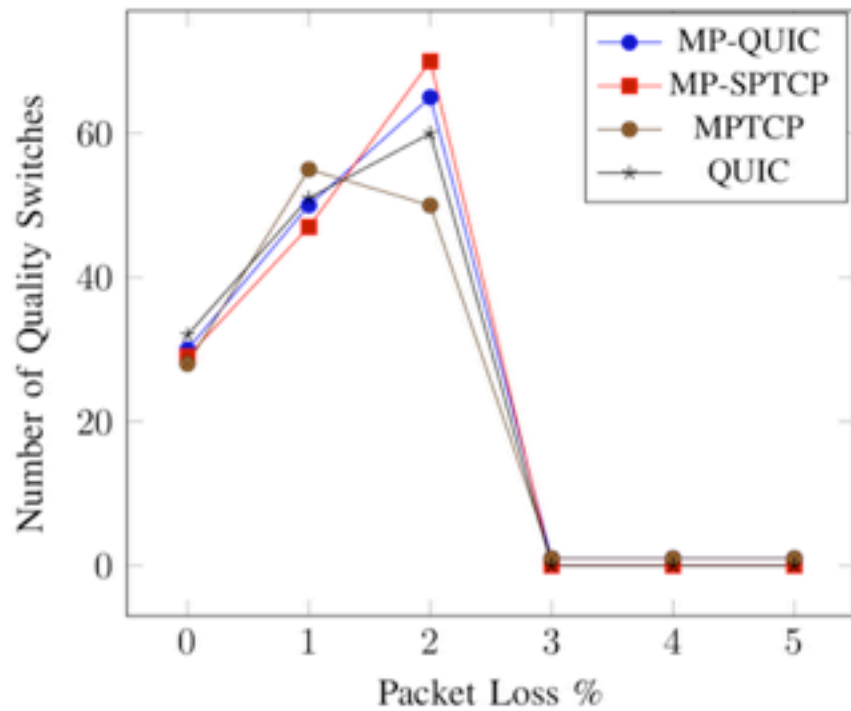


(b) Average connection throughput

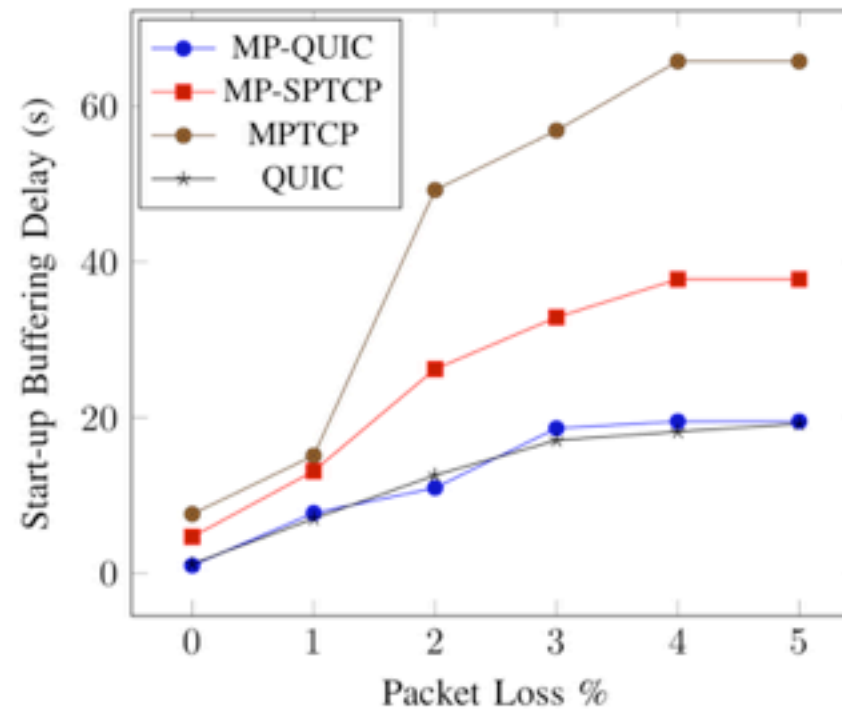


(c) Average time video playback stalled

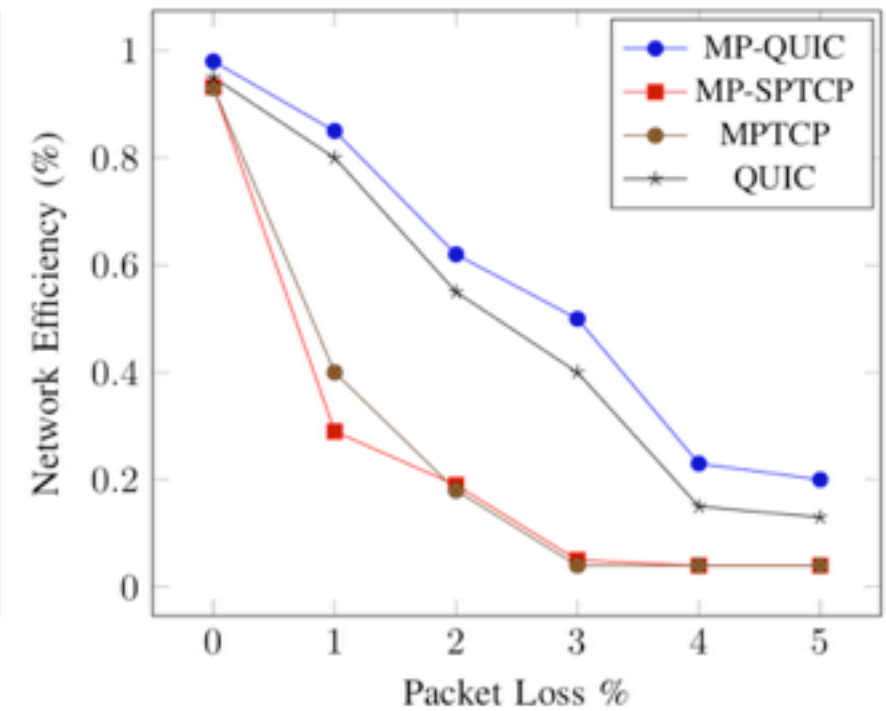
Evaluation



(d) Average number of quality switches



(e) Average start-up buffering delay



(f) Network usage efficiency

Conclusion

- A good example using SDN with standard protocols.
- Leverage path diversity for increased performance in low-loss networks and perform well in high-loss networks.
- Future work: scale of experiments, compare to other algorithms, using wireless networks.