

# Joint experimentation of modern Internet application protocols with SDN (Go-Quick)



Contact Person: Dr. Ioannis Giannoulakis  
giannoul@8bellsresearch.com

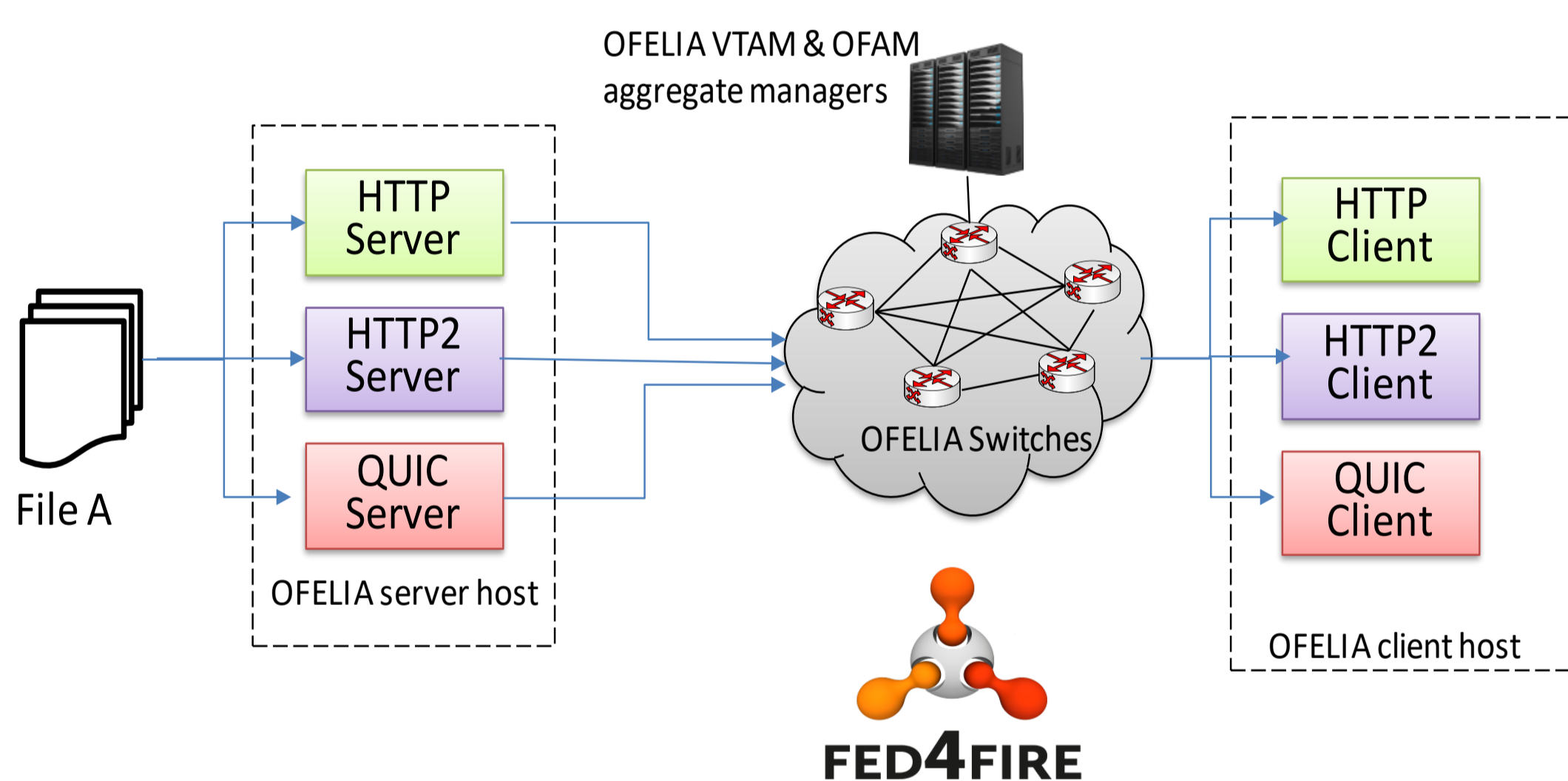
## Project Summary

Go-Quick experimentation aims to evaluate the performance of QUIC, as compared to HTTP and SPDY/HTTP2, through deploying virtual overlay networks on Fed4FIRE+ OpenFlow SDN-enabled infrastructure. Since sophisticated congestion avoidance and packet error correction mechanisms are used in all protocols, the actual network scenarios of the Go-Quick experiments determine which protocol performs best in each case. By deploying various network conditions and for different size of objects, performance metrics like throughput are assessed for the three protocols, QUIC, SPDY/HTTP2, and HTTP.

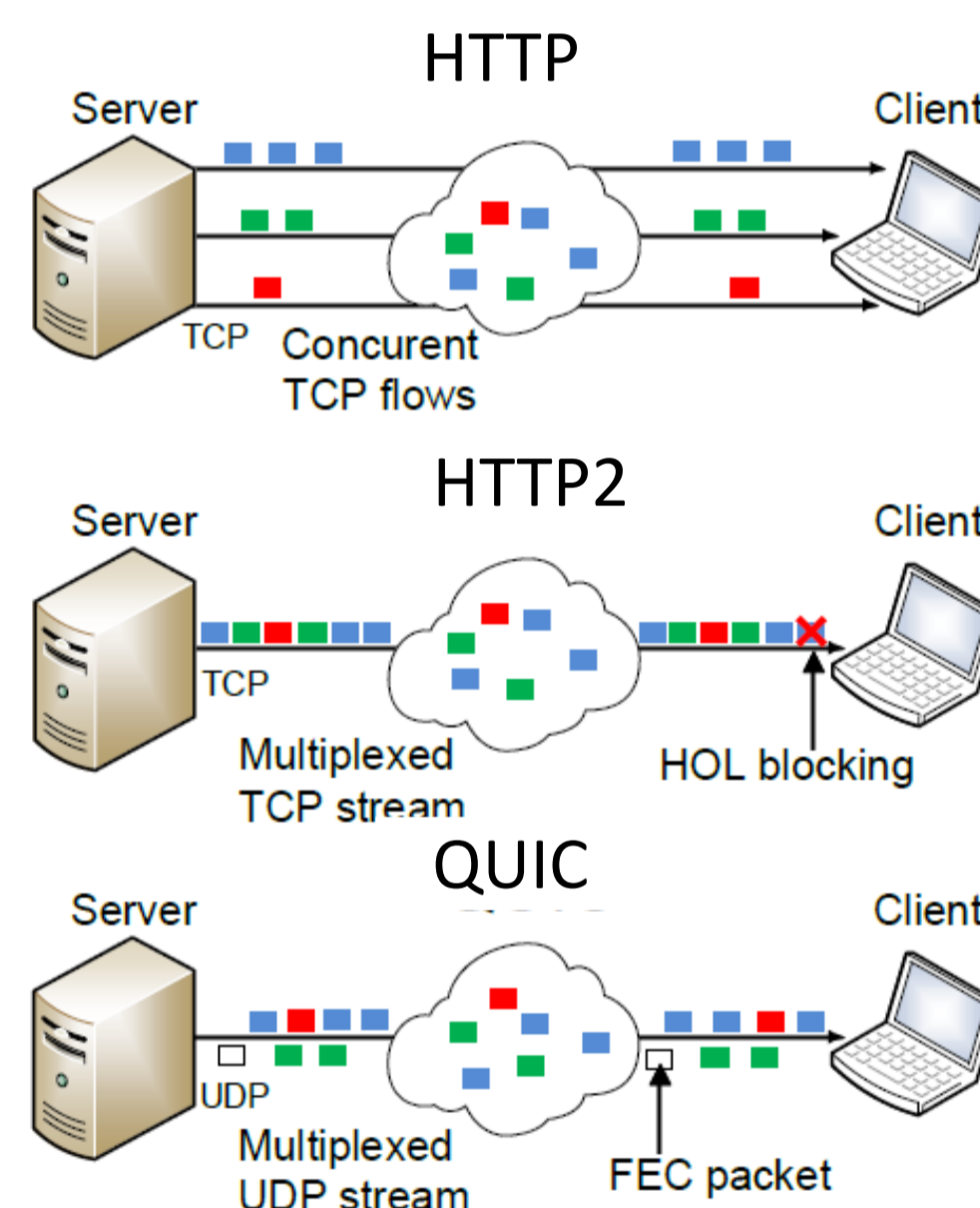
## Objectives

- Deployment of a virtual overlay network on Fed4FIRE+ OpenFlow SDN-enabled infrastructure
- Installation and configuration of QUIC, APACHE servers and emulation of different network conditions
- Google's QUIC Client and Server are meant mainly for integration testing: neither is performant at scale
- Go Quick has developed Bash scripts for full automation of the experiments
- Performance evaluation of QUIC as compared to other L7 protocols (e.g., HTTP/HTTP2)

## Go Quick Topology



## Internet Protocols in a nutshell



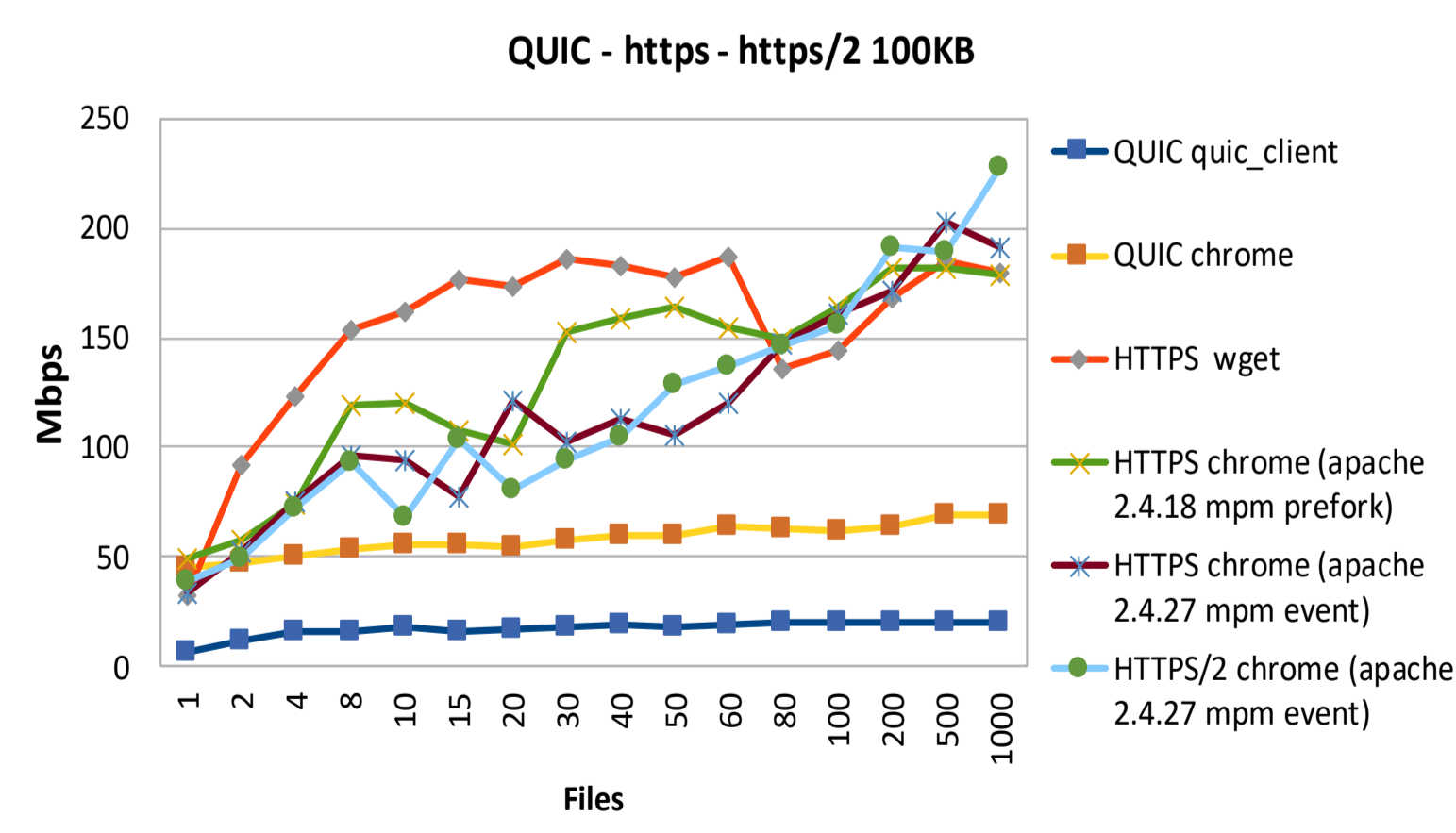
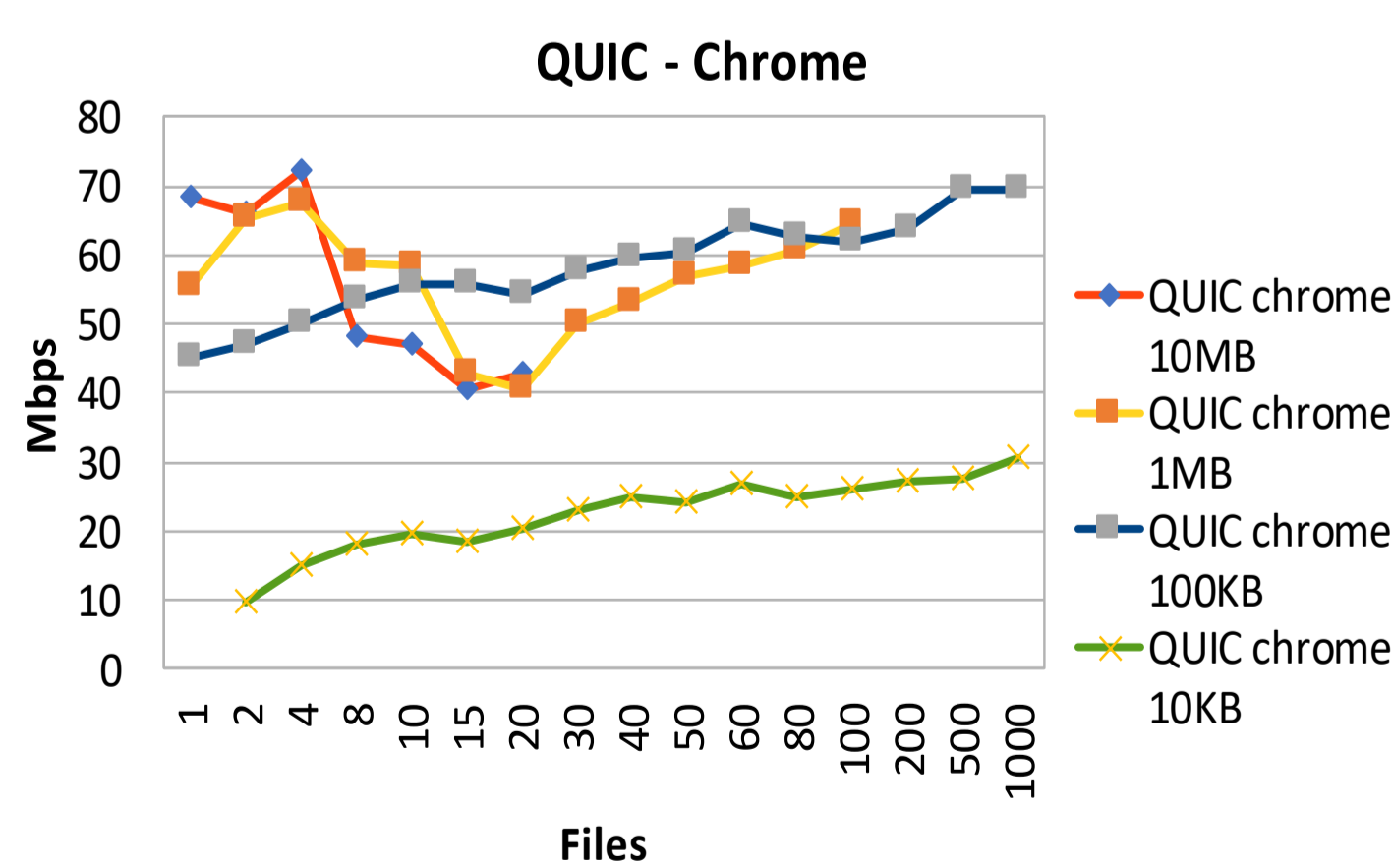
One of the bottlenecks of HTTP performance is the opening of too many TCP connections to achieve concurrency. A large portion of HTTP data flows consist of small (less than 15KB), bursty data transfers over dozens of distinct TCP connections.

Another limitation is that HTTP based web transfers are strictly initiated by the client. This presents a serious problem because it hurts performance significantly in the case of loading embedded objects.

HTTP2 introduces request prioritization. The client is allowed to specify a priority level for each object and the server then schedules the transfer of the objects accordingly.

QUIC is working over UDP. The protocol does not force in-order delivery of packets thus QUIC avoids HOL blocking.

\*P. Megyesi, Z. Kramer, S. Molnar, "How quick is QUIC?", in Proc. of IEEE ICC 2016, 22-27 May 2016.



- QUIC aims to improve performance compared to HTTP, HTTP2 by multiplexing web objects in one stream over UDP
- "Go Quick" performed a comparative analysis

- In all scenarios QUIC protocol is outperformed by HTTPS/HTTPS2
- OFELIA SDN physical switches were configured to route data and to create congestion and losses according to the network scenarios of the experiment.

- For typical web object sizes and for a big number of objects (i.e., many parallel flows), HTTPS2 is up to 80% better.
- In future work, measurements with Google Sites Server will be collected to exploit multi-threading capabilities.



Eight Bells Ltd is a start-up company specializing in modelling and analysis for businesses as well as in selected parts of Information and Communication Technologies (ICT), based in Nicosia, Cyprus. The company has been established recently by ICT researchers and financial analysts pursuing the application of their research expertise and innovations in the ICT related arena. Eight Bells delivers customizable solutions that enhance modern communications relevant to the area of 5G Mobile Technology, Network Function Virtualization (NFV) and also management solutions for Cloud infrastructures.

[www.8bellsresearch.com](http://www.8bellsresearch.com)