

L4S IN A 4G/5G CONTEXT

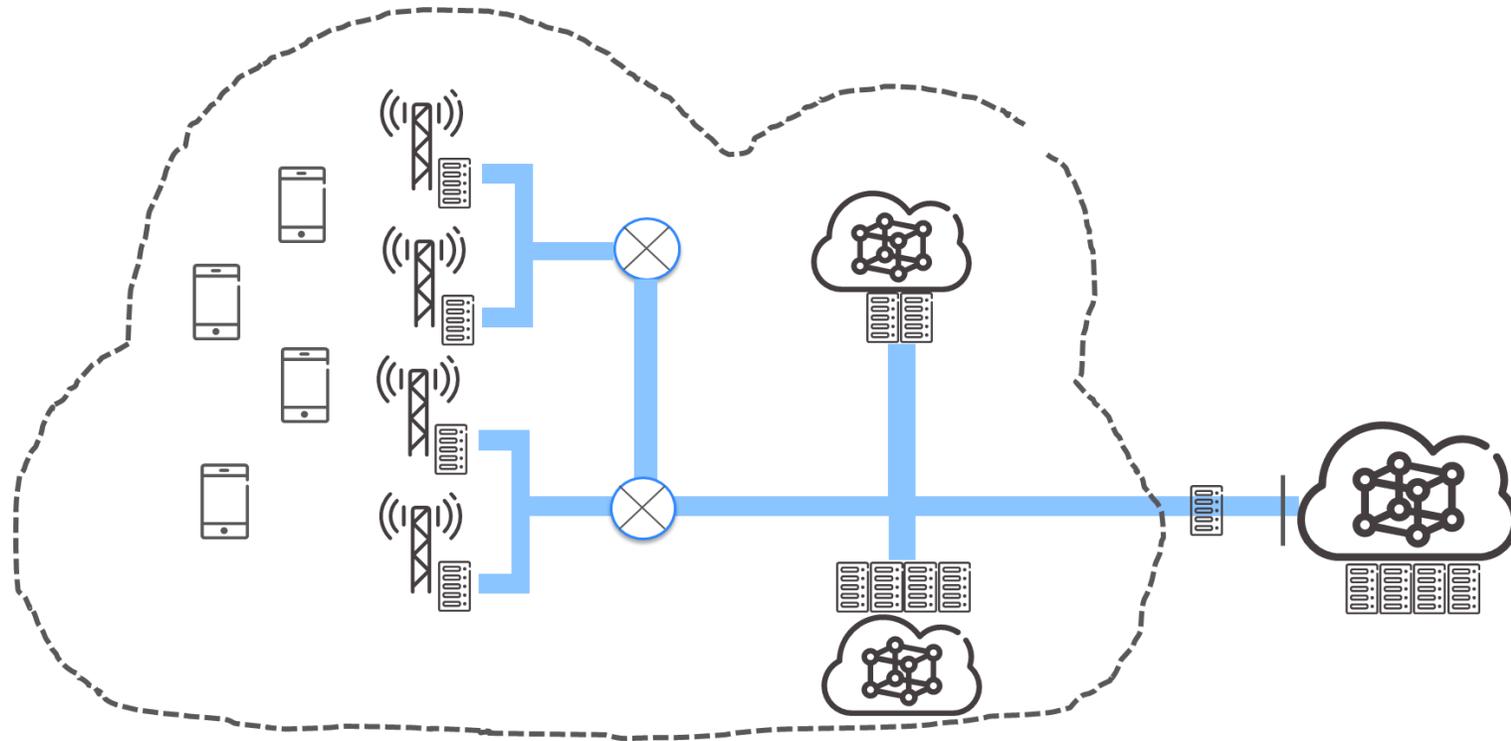
MOTIVATION



- Why
 - › Mix of short & long flows
 - › Content closer to edges, possibly more bursty traffic

- Need
 - › Low latency for short flows, high utilization for long flows, and high burst tolerance

- How
 - › Investigate L4S/DCTCP for 4G/5G radio access network



SIMULATION EXAMPLES

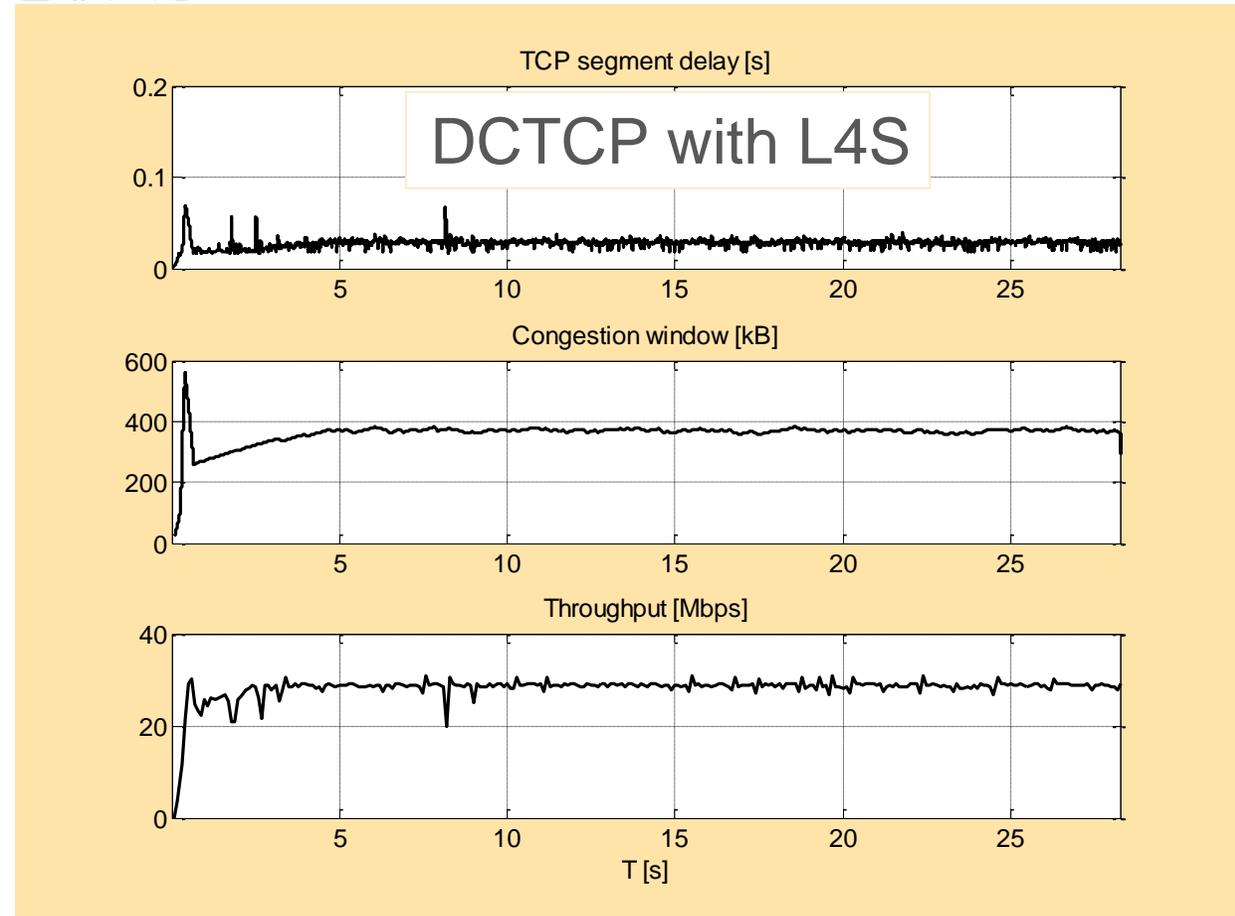
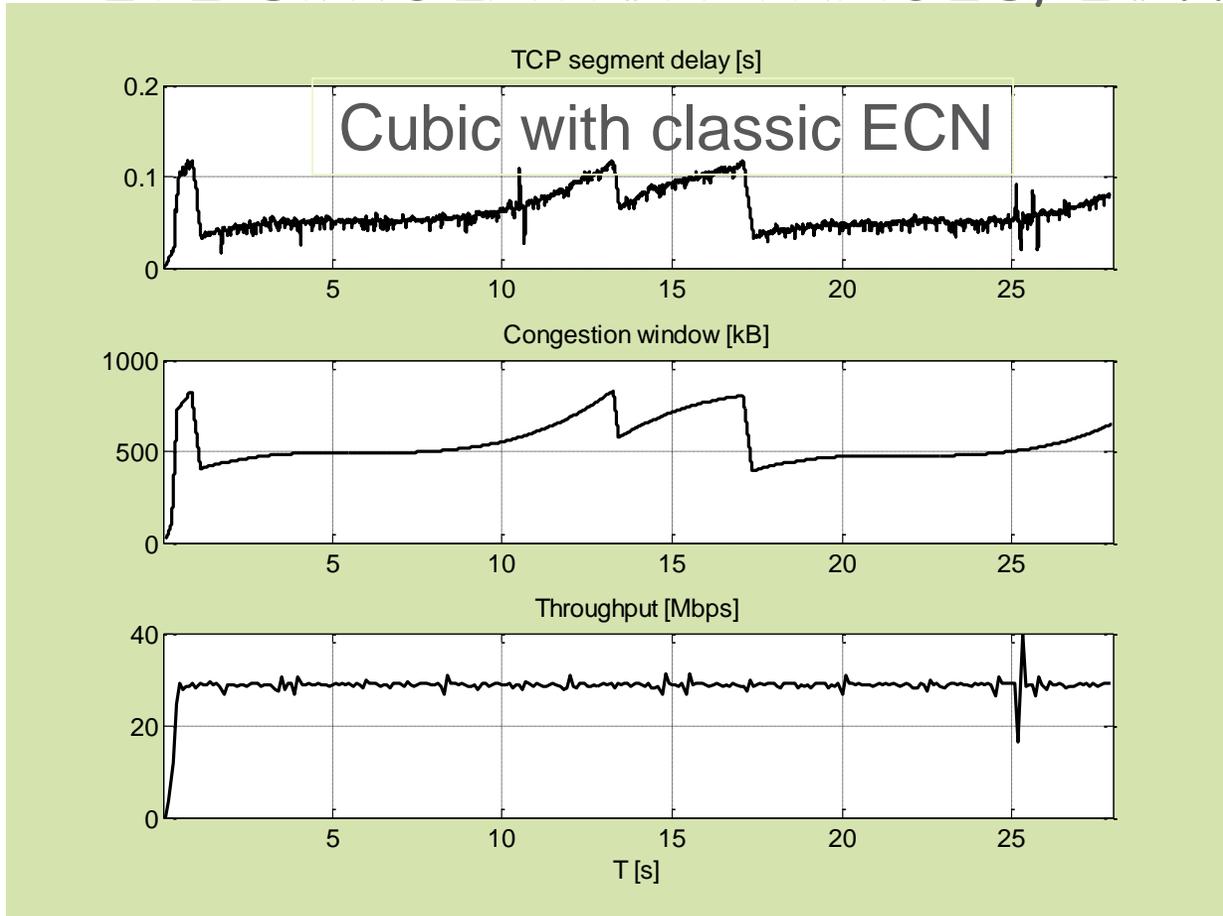


- › Promising technology : Initial LTE simulations show that L4S has potential to give both high throughput and low latency
- › L4S marking algorithms are not fully tuned in examples

- › Examples shown
 - Cubic with classic ECN vs DCTCP with L4S
 - Realtime media (SCReAM)

CUBIC VS DCTCP IN LTE

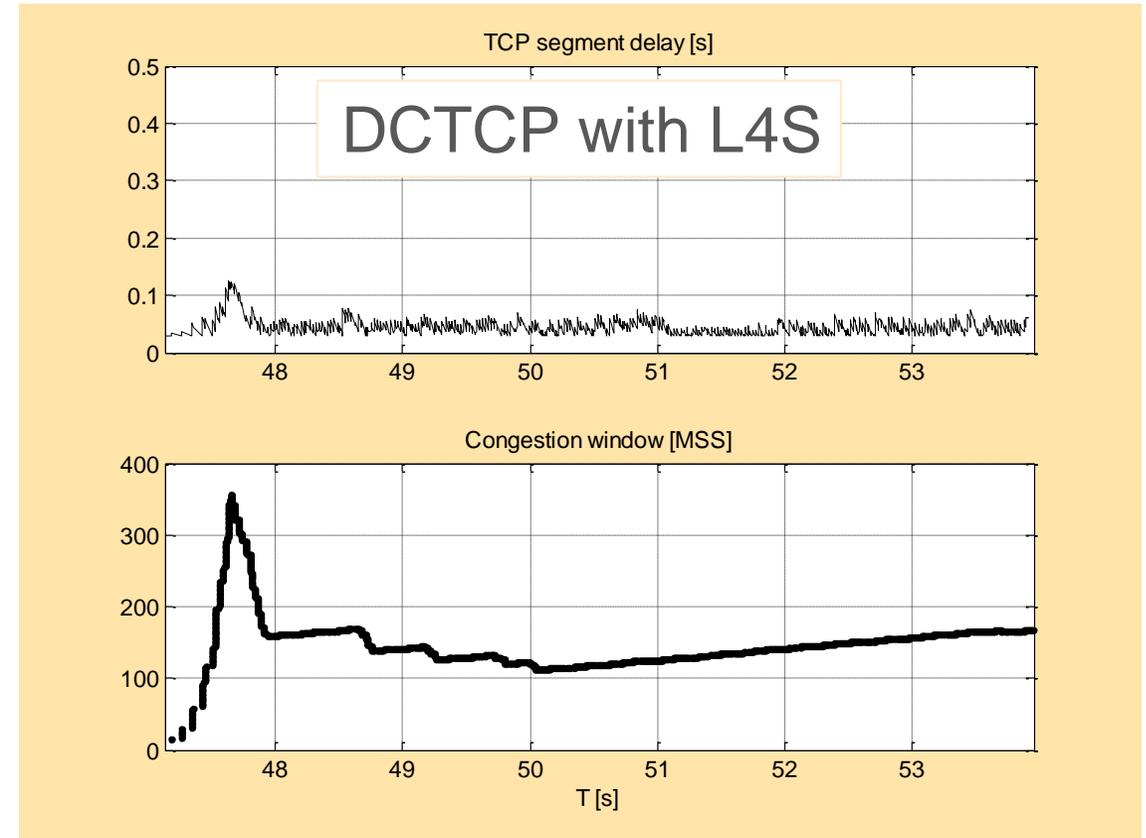
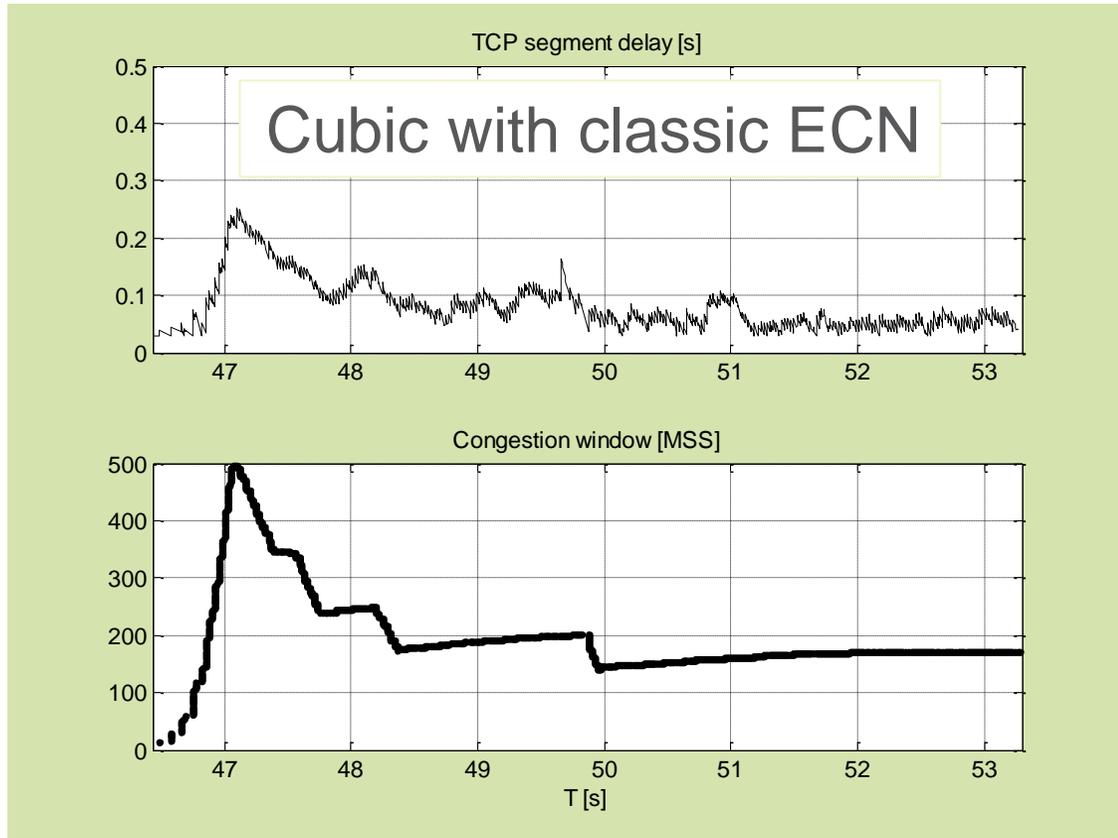
LTE SIMULATION TRACES, LOW LOAD



DCTCP : High throughput maintained with reduced queuing delay

BENEFITS FOR DATA TRAFFIC

LTE SIMULATION TRACES, HIGHER LOAD



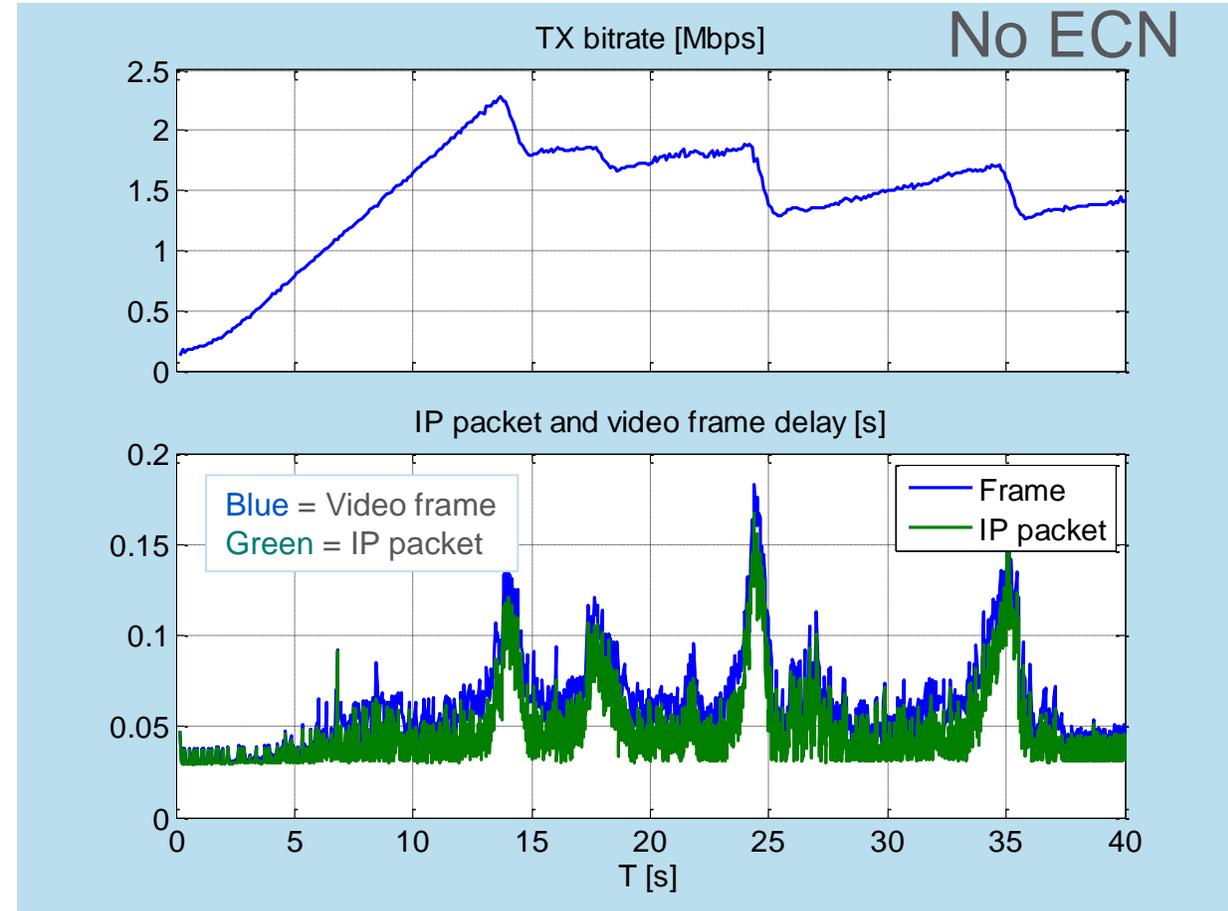
DCTCP w. L4S gives lower latency under load
..and it is possible to implement it in 4G/5G

BENEFITS FOR REALTIME MEDIA

SCReAM, LTE SIMULATION



- › SCReAM relies on packet loss and delay as congestion signals
- › Packet loss is not desired as it generally gives extra e2e delay
- › Delay is not a clear congestion indicator as increased delay can occur for a number of reasons
- › ECN gives a clear congestion indicator → next slide..



BENEFITS FOR REALTIME MEDIA

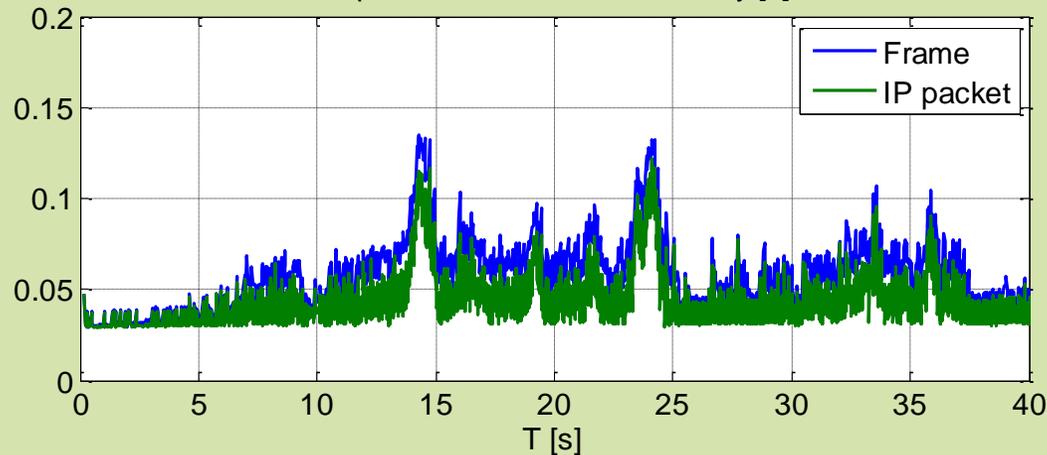
SCREAM, LTE SIMULATION



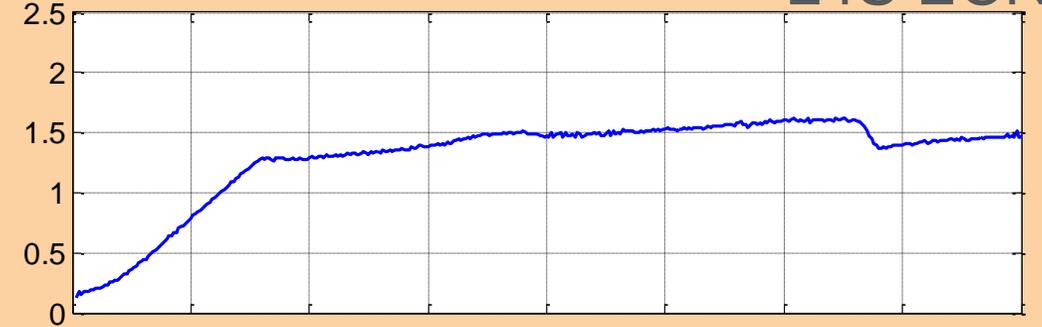
TX bitrate [Mbps] Classic ECN



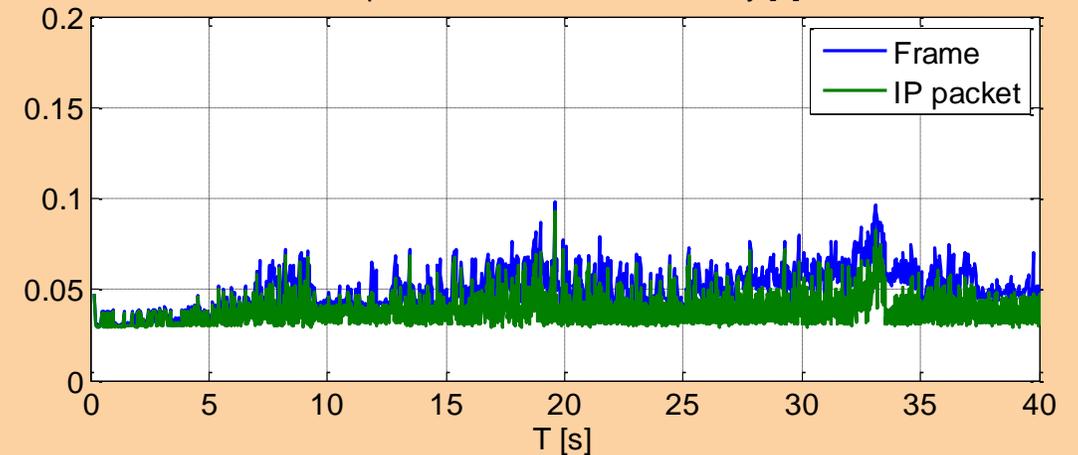
IP packet and video frame delay [s]



TX bitrate [Mbps] L4S ECN



IP packet and video frame delay [s]



ECN reduces delay and rate variations to some extent
L4S ECN improves things even more