

DualQ Coupled AQM

draft-briscoe-tsvwg-aqm-dualq-coupled-00

IETF-97 Nov 2016

Koen De Schepper

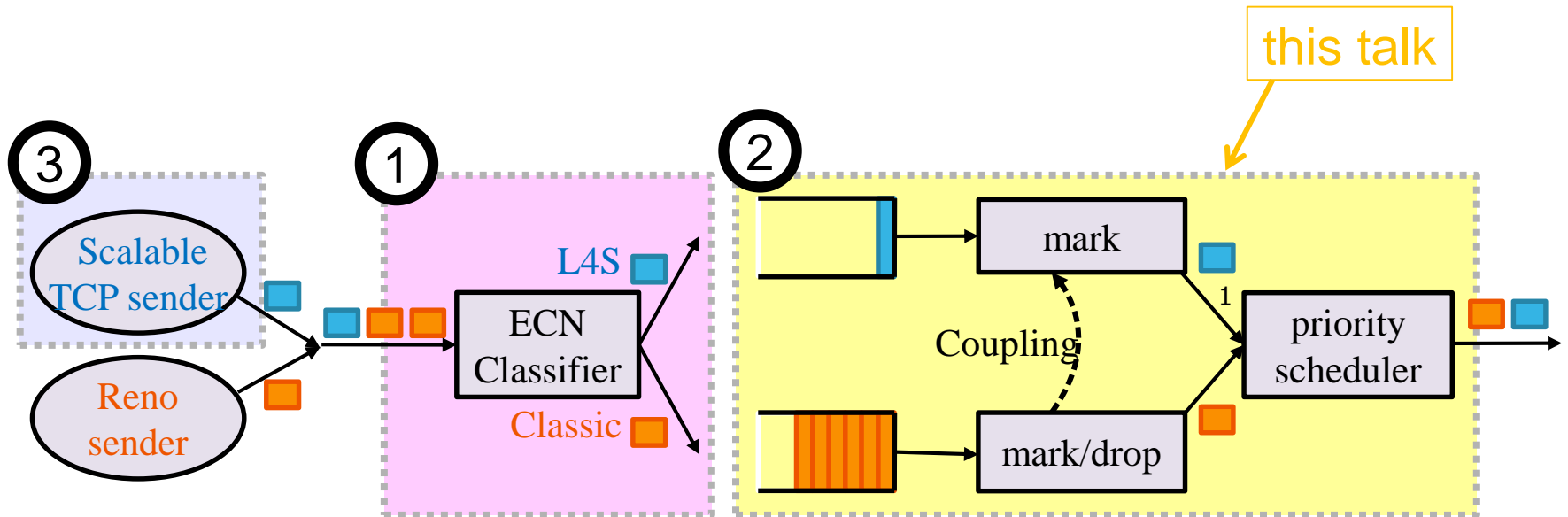
Bob Briscoe

Olga Bondarenko

Inton Tsang

L4S: low latency, low loss, scalable throughput

3 parts to standardise



1)	The identifier	draft-briscoe-tsvwg-ecn-l4s-id	tsvwg
2)	The DualQ AQM	draft-briscoe-tsvwg-aqm-dualq-coupled	tsvwg?
3)	Scalable transports	many	?

Updated version available

Name change: aqm-...-02 → tsvwg-aqm-...-00

Added Dual-PI2 as alternative to CurvyRED

- Reference to PI2 paper
- Dual-PI2 pseudo-code

Improved overload for both PI2 and CurvyRED:

- Time-shifted FIFO pseudo code
- Tail-drop on overload

ECN – Drop fairness problem (not only for DualQ!!)

Needs special overload considerations because:

goodput for “100% drop” \leftrightarrow “100% mark”

Window at least 2MTU \rightarrow ECN becomes unresponsive

Equal Window up to ~25% drop | ~25% Classic-mark
| ~100% DCTCP*-mark

Above ~25% not-ect traffic starves

\rightarrow reasonable overload threshold

* Different when L4S/TCP-Prague supports Window $<$ 2MTU

Overload strategies

AQM is no flow policer !

- Optional separate function
- Standalone AQM still needs to handle overload

2 possible strategies for overload protection

a) Limit AQM drop / mark → rely on tail-drop

- Sacrifices latency
- Avoids drop of ECN traffic when Q not overflowing

b) Switch to Classic AQM drop for all

- Preserves low latency

Following overload experiments show a) drop/mark limit \rightarrow tail-drop

Coupling: $p_C = (p_L/k)^2$

$k=2 \rightarrow$ Limit p_L to 100%

$\rightarrow p_C = 25\%$

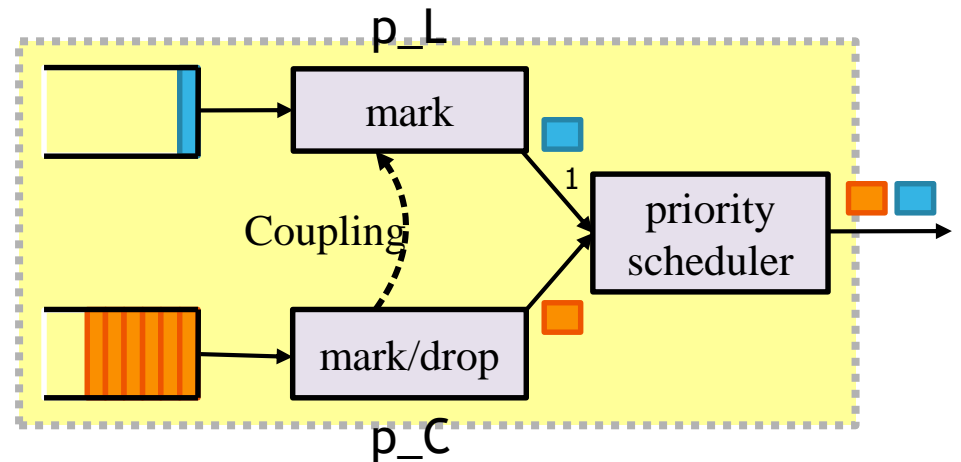
(happy coincidence 😊)

Link: 100Mbps, 7ms base RTT

Classic Target: 20ms

5 TCP flows of each class

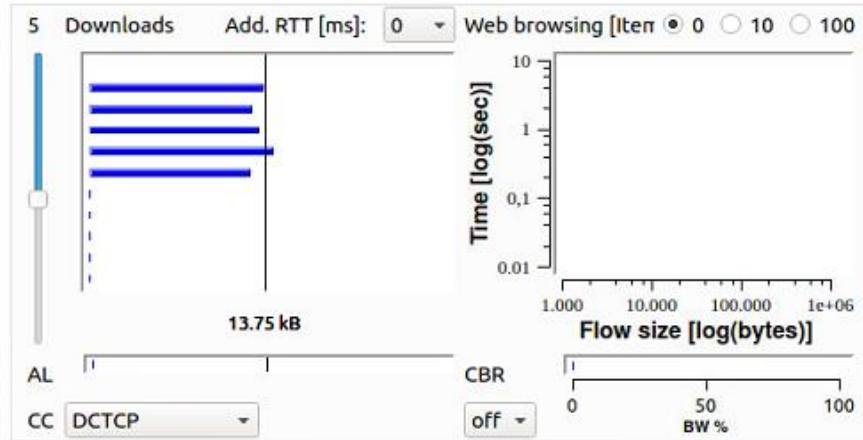
UDP traffic of 50, 100, 200Mbps



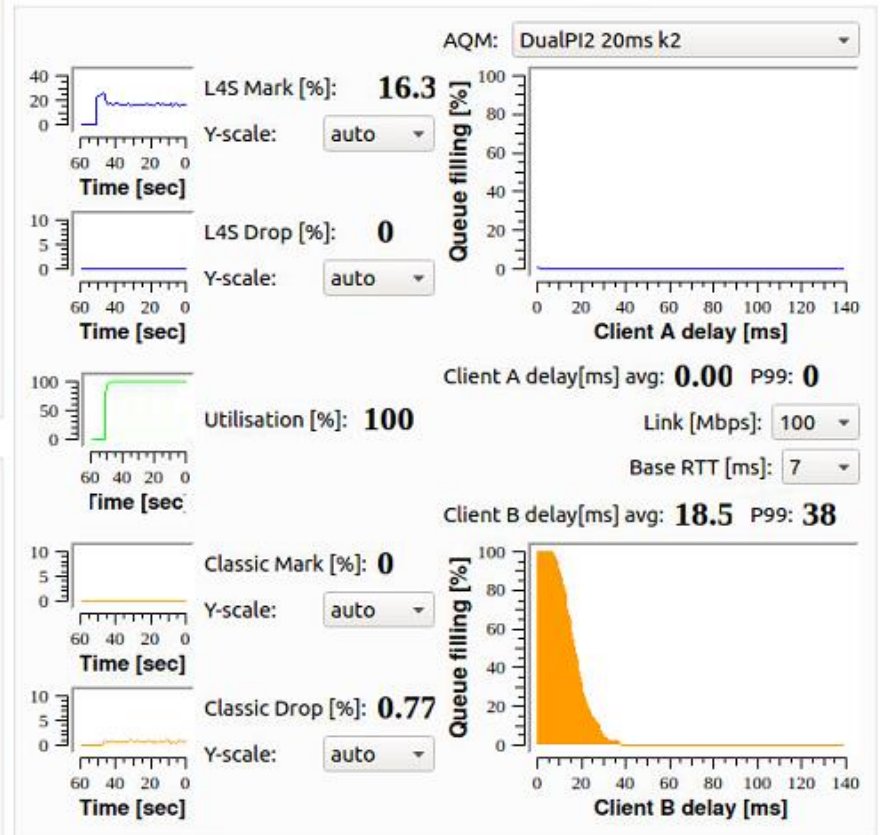
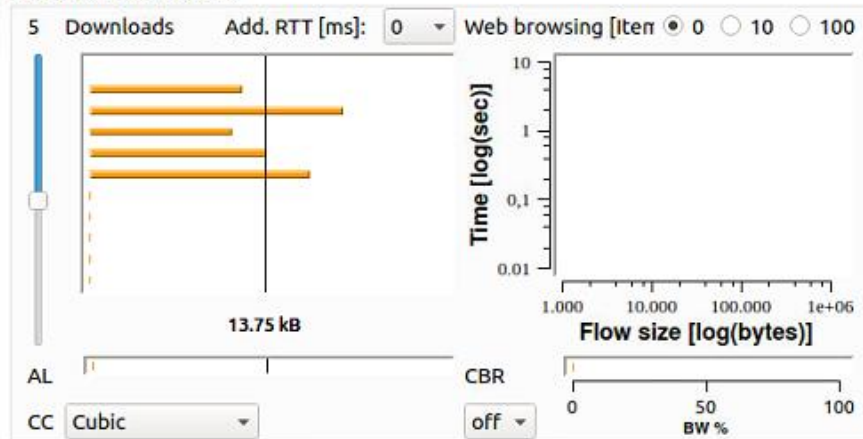
No unresponsive traffic

10 TCP on 100Mbps Baseline

Client IP: 10.187.16.194



Client IP: 10.187.16.112



Rate Window

w/HS wo/HS Clear

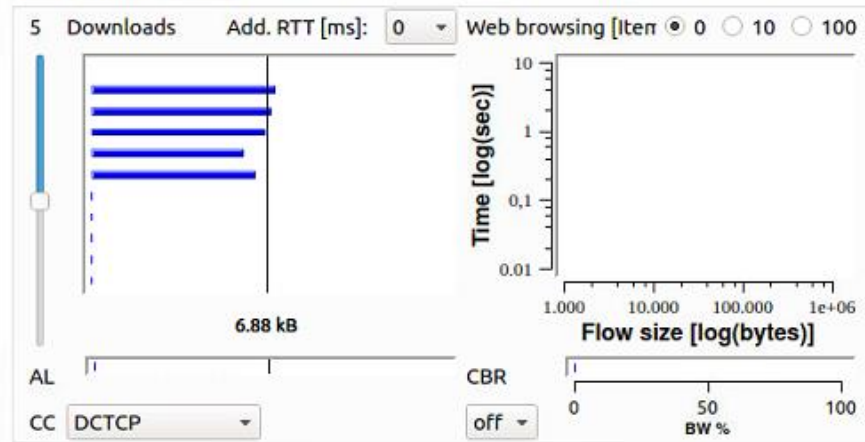
ECN IP

a)

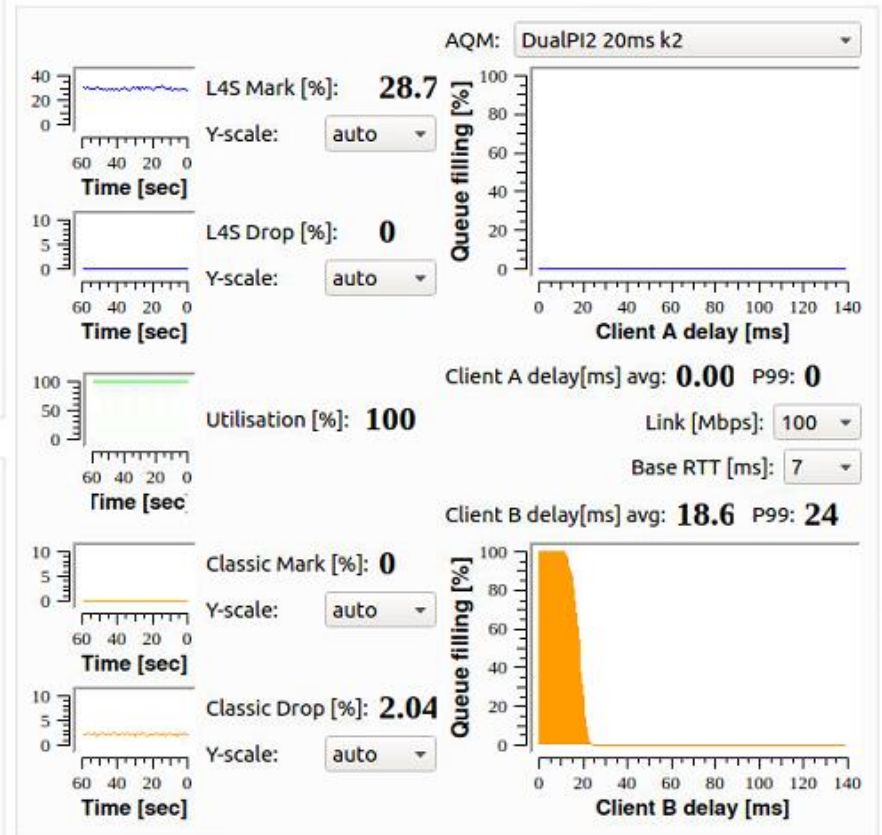
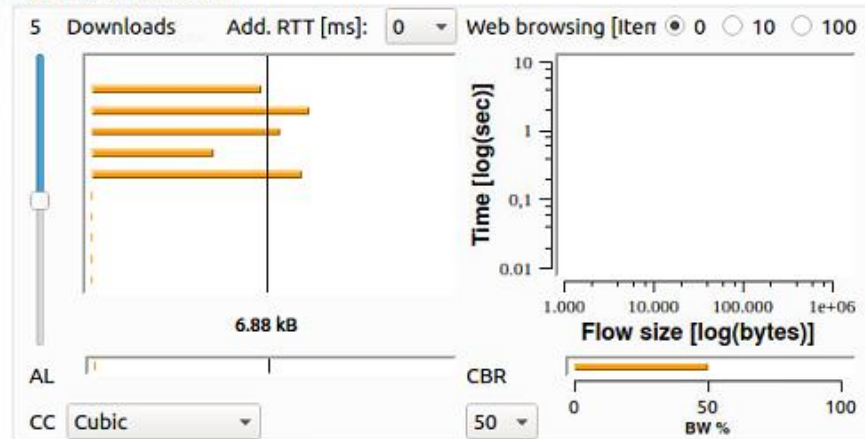
50Mbps unresponsive Classic UDP traffic

Rest is shared fairly

Client IP: 10.187.16.194



Client IP: 10.187.16.112

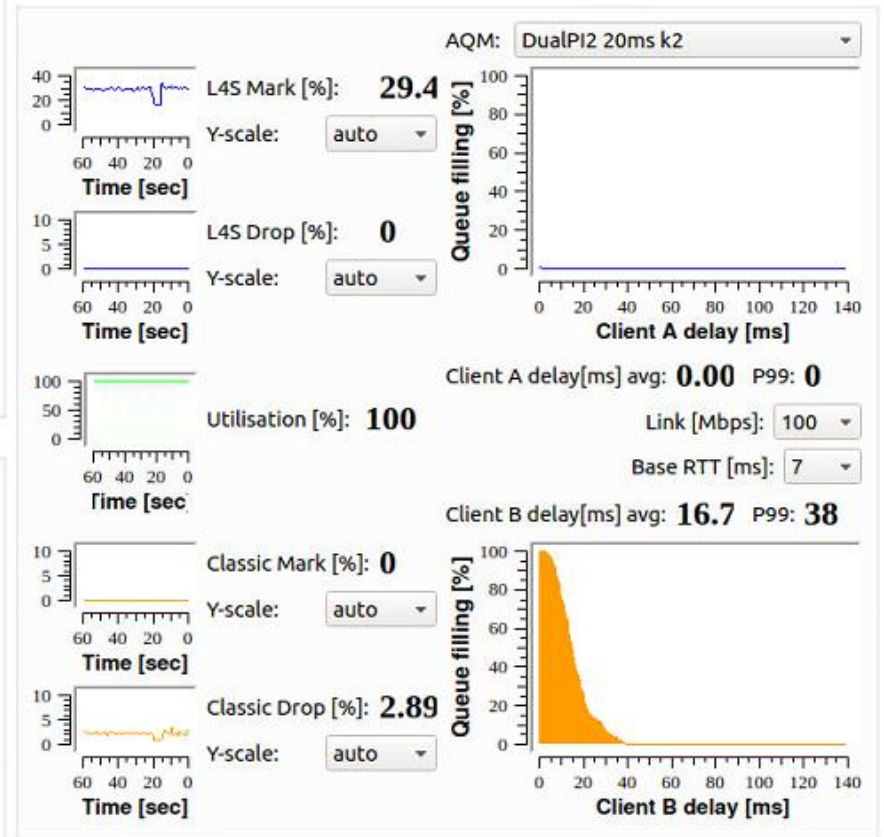
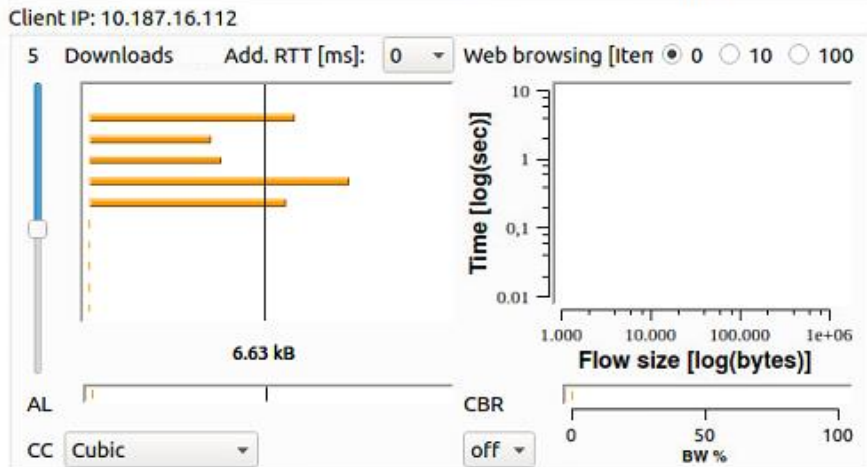
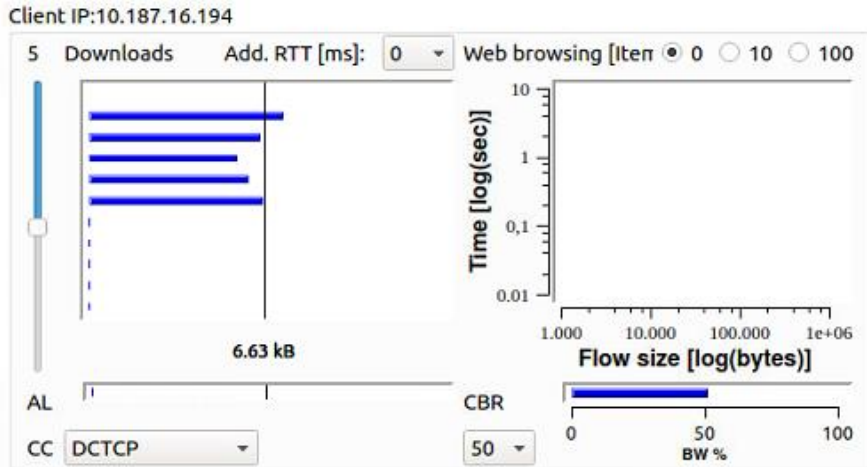


a)

ECN IP

50Mbps unresponsive L4S UDP traffic

Rest is shared fairly

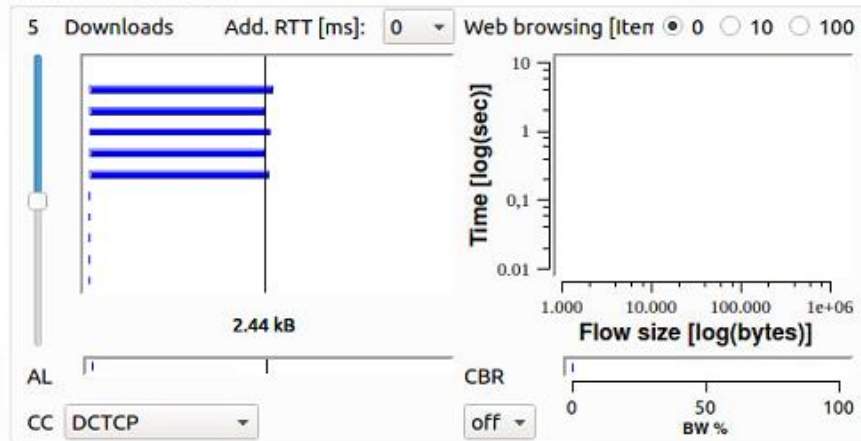


a)

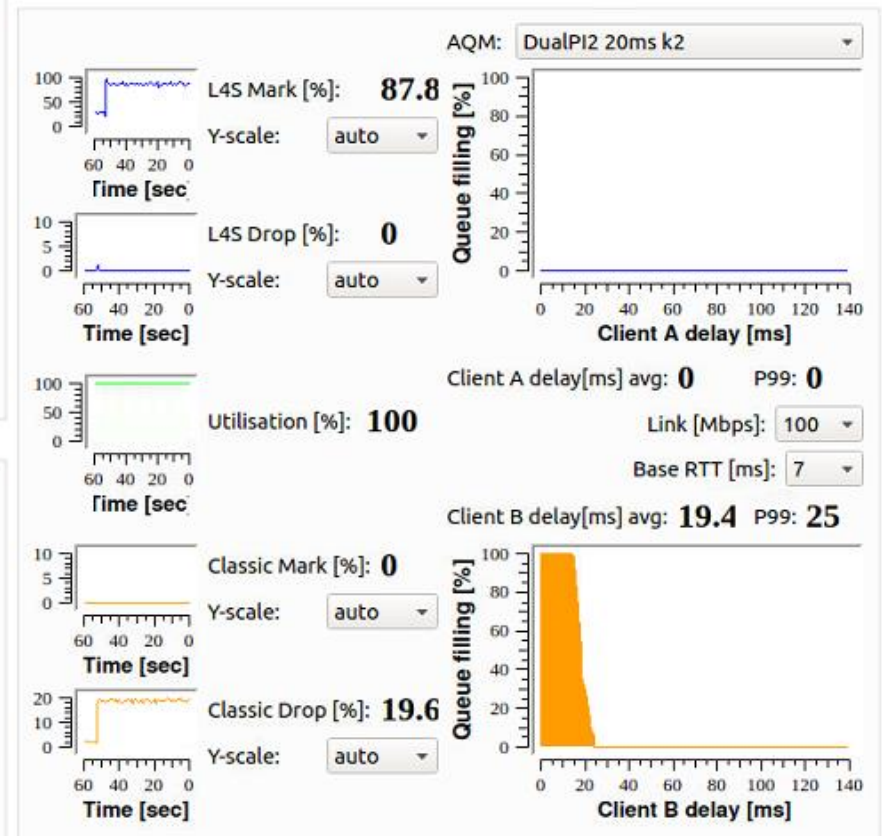
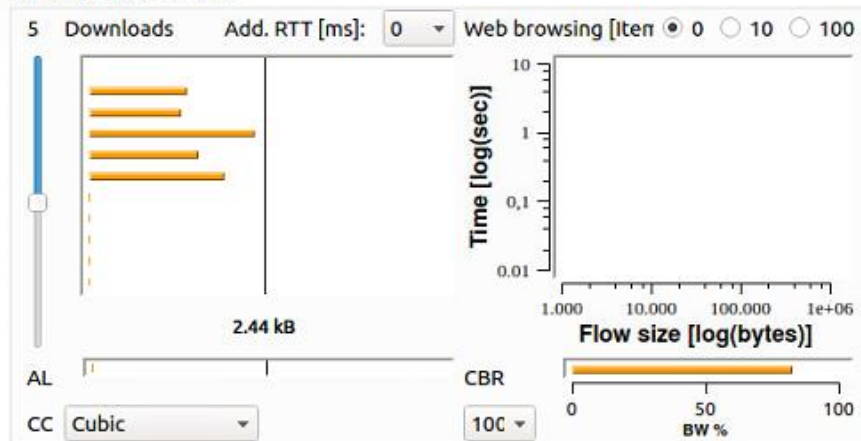
100Mbps unresponsive Classic UDP traffic

Drop below 25%, still fair

Client IP: 10.187.16.194



Client IP: 10.187.16.112



Rate Window w/HS wo/HS Clear

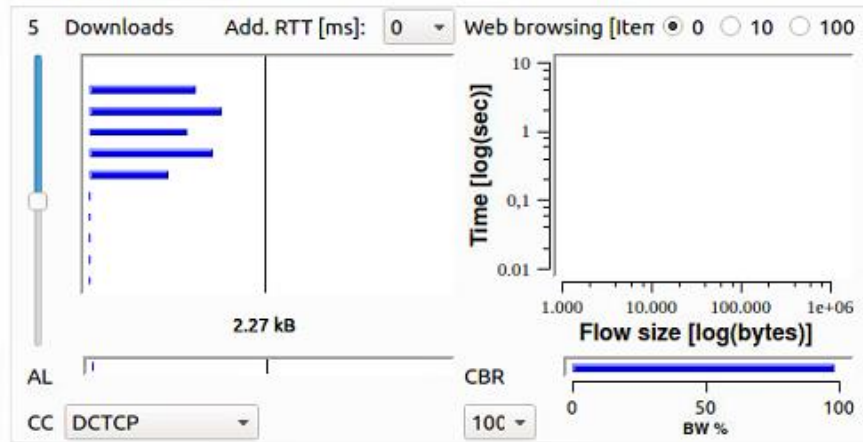
a)

ECN IP

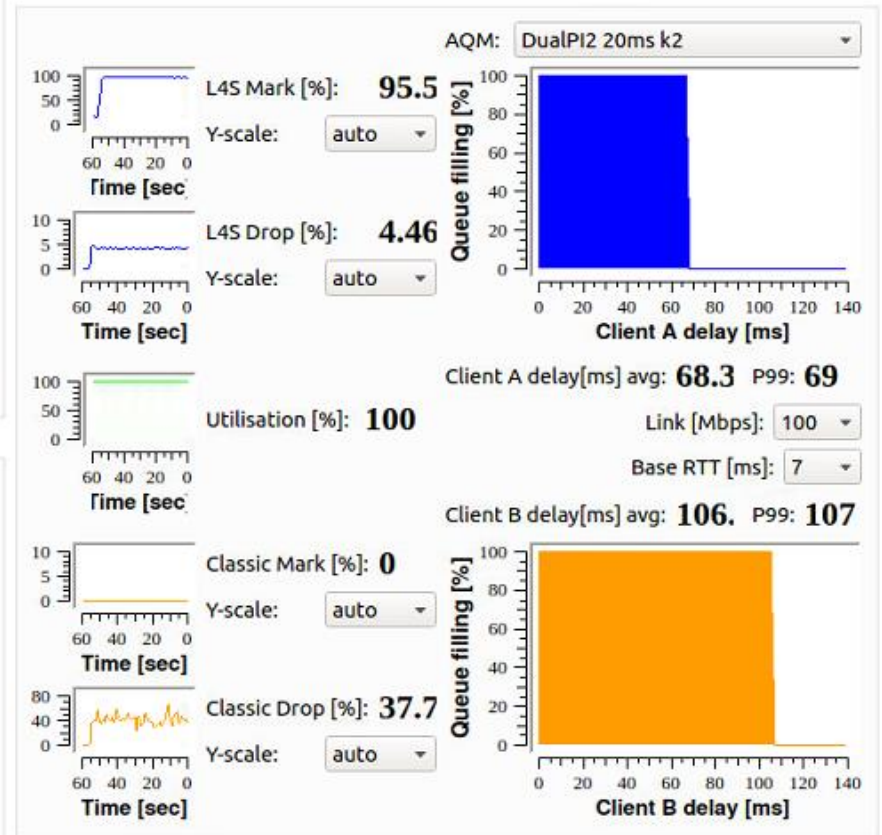
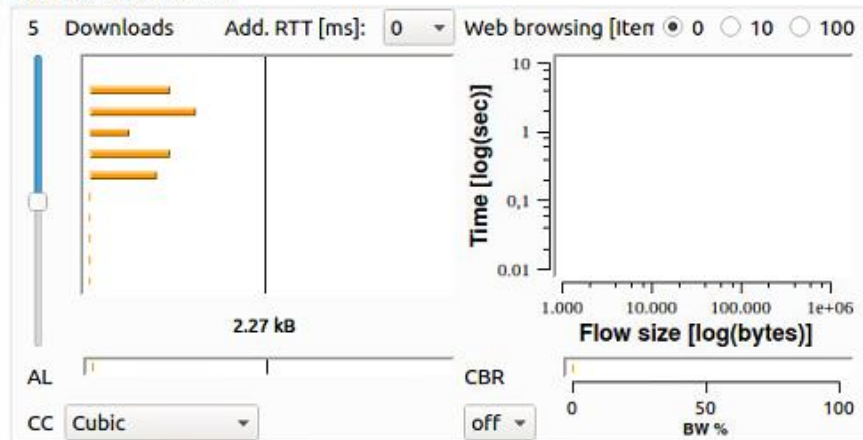
100Mbps unresponsive L4S UDP traffic

Controlled drop < 25% → tail drop

Client IP: 10.187.16.194



Client IP: 10.187.16.112



Rate Window w/HS wo/HS Clear

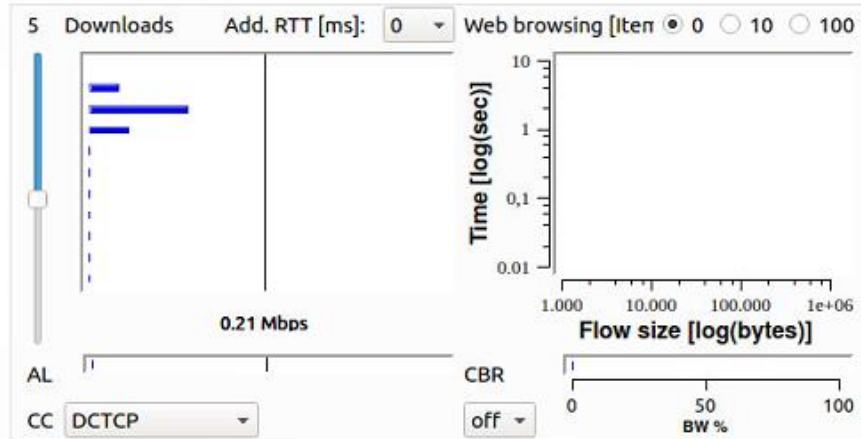
ECN IP

a)

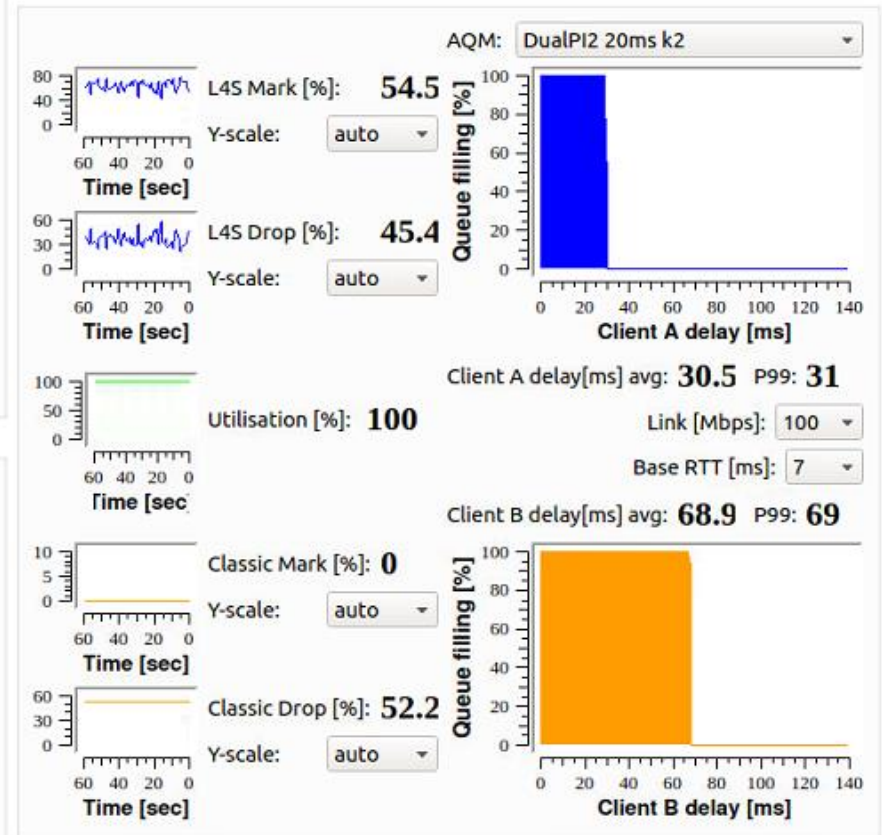
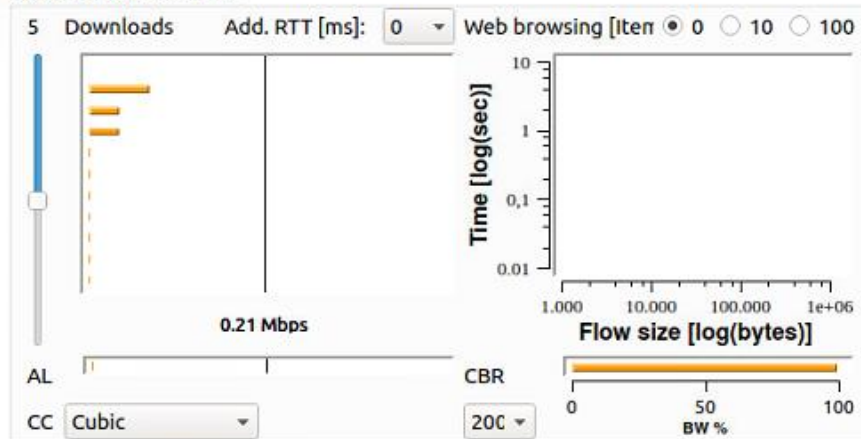
200Mbps unresponsive Classic UDP traffic

52% drop 69ms delay

Client IP: 10.187.16.194



Client IP: 10.187.16.112



Rate Window

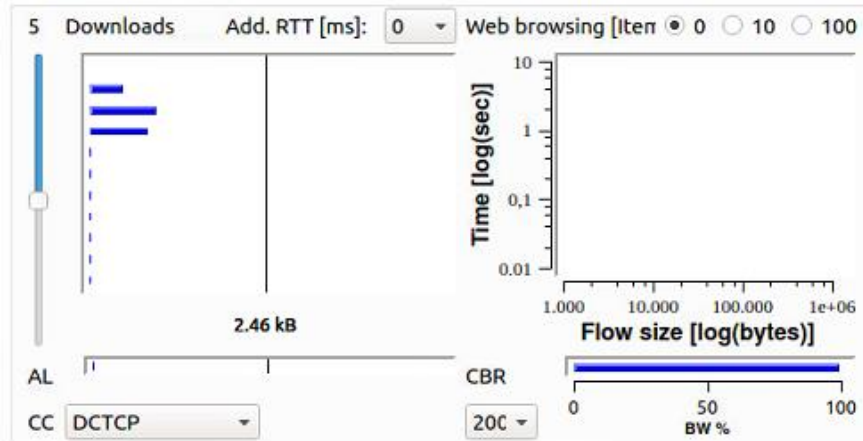
w/HS wo/HS Clear

ECN IP

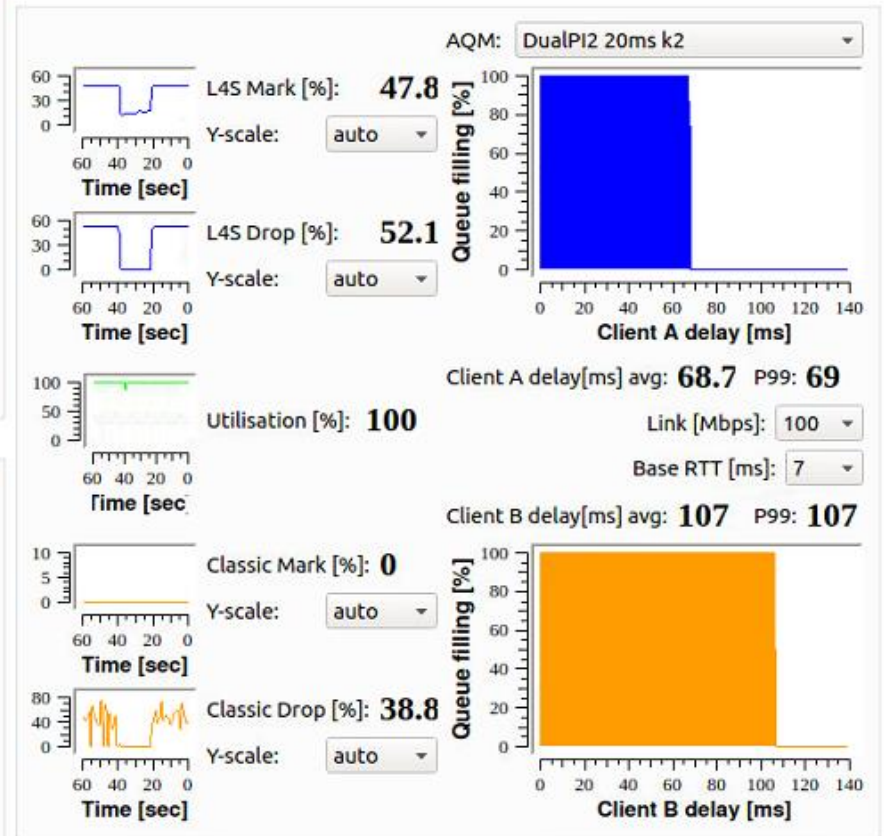
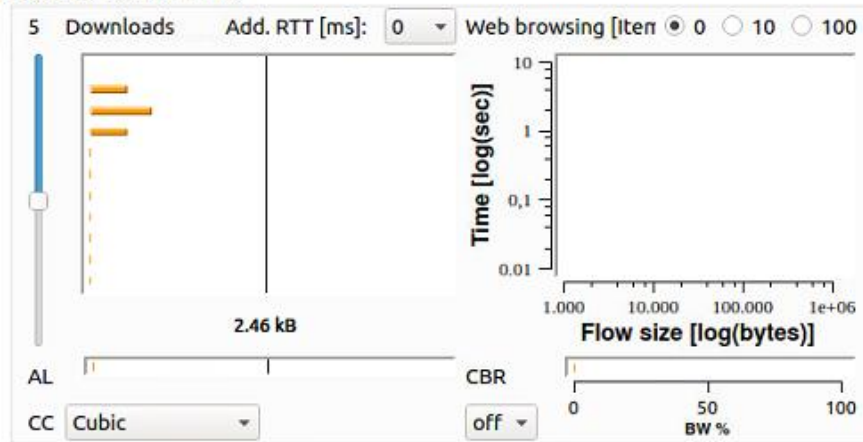
a)

200Mbps unresponsive L4S UDP traffic also 52% drop 69ms delay

Client IP: 10.187.16.194



Client IP: 10.187.16.112



Rate Window

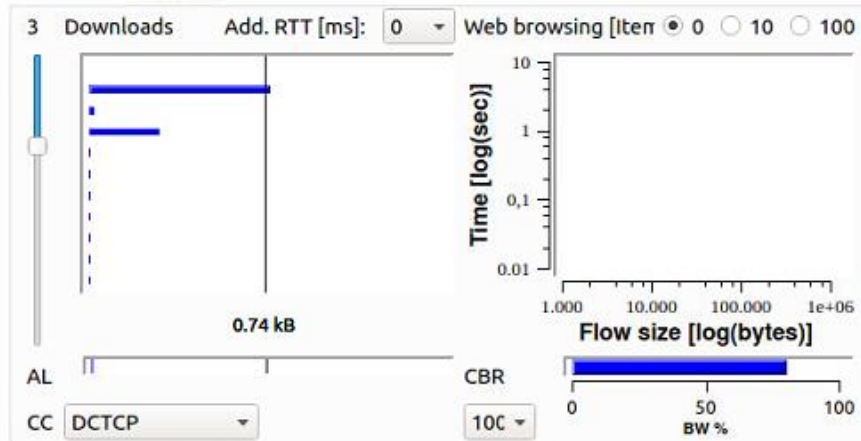
w/HS wo/HS Clear

a)

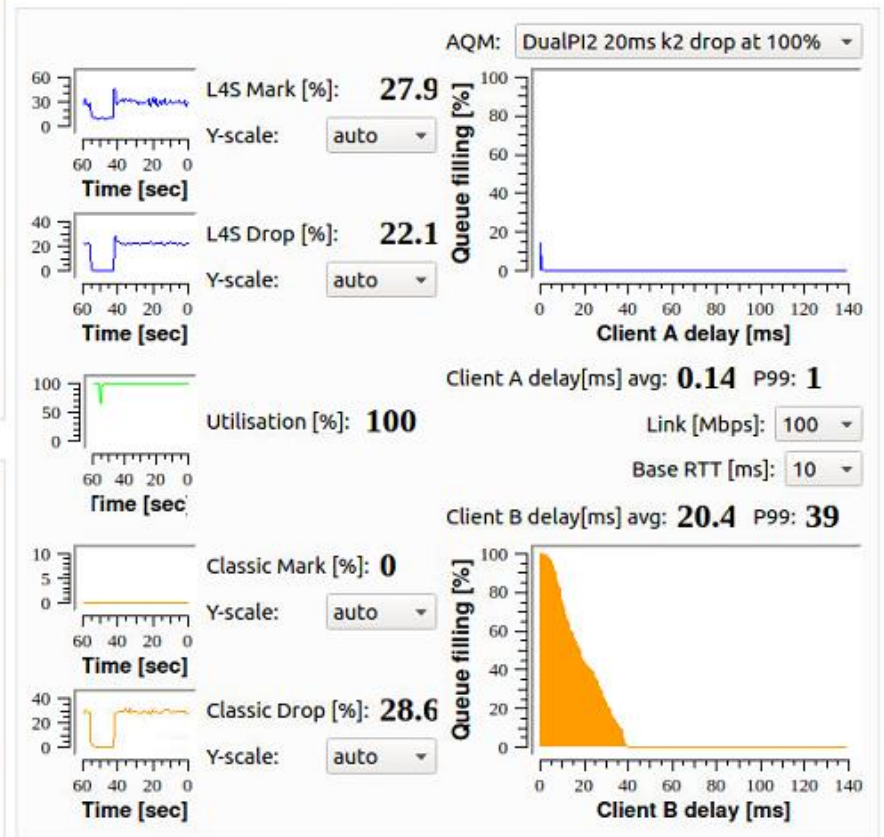
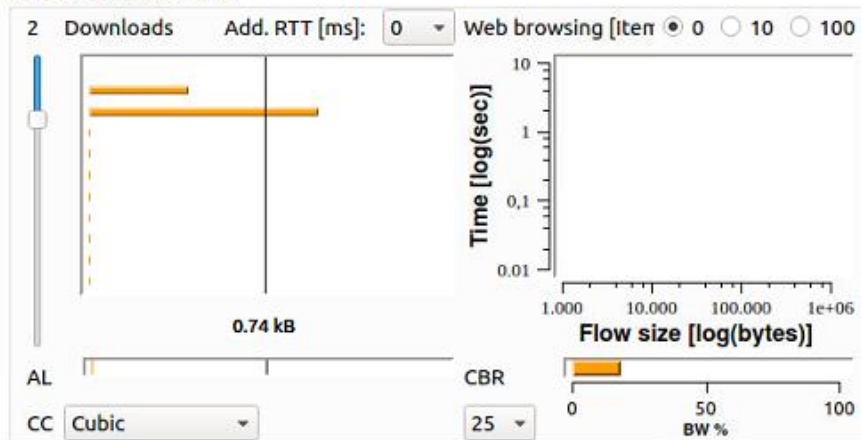
ECN IP

Switch to Classic drop for all Preserves low latency Q

Client IP:10.187.16.194



Client IP: 10.187.16.112



Rate Window

w/HS wo/HS Clear

ECN IP

b)

Adoption of draft?

- Please review, comment, implement and discuss further on tsvwg@ietf.org cc: tcpprague@ietf.org
- Ready for adoption with only DCTCP experience?
- Is it OK to evolve DualQ for TCP-Prague after adoption?