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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” <> “100% mark”

Window at least 2MTU → ECN becomes unresponsive

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

Above ~25% not-ect traffic starves
  → 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
50Mbps unresponsive Classic UDP traffic
Rest is shared fairly

a)
50Mbps unresponsive L4S UDP traffic
Rest is shared fairly

a)
100Mbps unresponsive Classic UDP traffic
Drop below 25%, still fair

a)
100Mbps unresponsive L4S UDP traffic
Controlled drop < 25% → tail drop

a)
200Mbps unresponsive Classic UDP traffic
52% drop 69ms delay
200Mbps unresponsive L4S UDP traffic also 52% drop 69ms delay
Switch to Classic drop for all
Preserves low latency Q
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?