L4S Status Update

draft-ietf-tsvwg-l4s-arch-14

draft-ietf-tsvwg-ecn-l4s-id-22

draft-ietf-tsvwg-aqm-dualq-coupled-19

Bob Briscoe, Independent   <ietf@bobbriscoe.net>

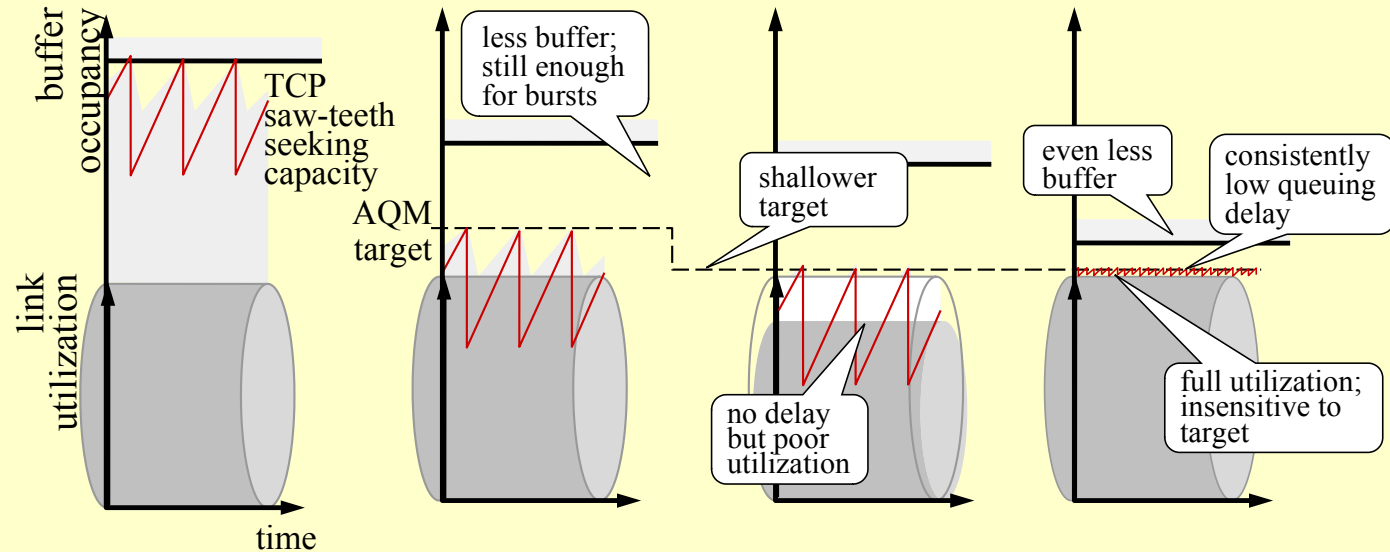Koen De Schepper, **NOKIA** Bell Labs <koen.de_schepper@nokia.com>

Greg White,   *CableLabs®*   <g.white@CableLabs.com>

tsvwg, IETF-112, Nov 2021

Recap – L4S Motivation

- Very low queuing delay potentially for *all* Internet applications

- including for capacity-seeking & capacity-adaptive

The trick: scalable congestion control

	(1) Today (typical)	(2) Today (at best)	(3) Unacceptable	(4) L4S
Bottleneck	Bloated drop-tail buffer	AQM	Shallower AQM	Immediate AQM
Sender CC	Classic	Classic	Classic	Scalable (tiny saw-teeth)

buffer occupancy

TCP saw-teeth seeking capacity

less buffer; still enough for bursts

AQM target

shallower target

even less buffer

consistently low queuing delay

link utilization

no delay but poor utilization

full utilization; insensitive to target

time

Recent L4S-Related News

- Pete Heist's continuing 'red team' testing & evaluation
    - https://github.com/heistp/l4s-tests/#readme
    - esp. bursty links, bursty flows

- Linux (FQ-)CoDel patch to enable L4S support/testing
    - already optional shallow immediate ECN threshold in each flow-queue (for DCs) [RFC8290; §5.2.7]
    - patch allows ECT(1) specific threshold [Toke H-J & Eric Dumazet]

      `tc qdisc replace dev eth0 root fq_codel ce_threshold 1ms ce_threshold_selector 0x1/0x3`
    - regular CoDel machinery deeper in each queue for ECT(0) & Not-ECT

- Stuart Cheshire's emails
    - won't presume to summarize for Stuart

L4S drafts

- Just completed processing of WGLC review comments
  - draft-ietf-tsvwg-l4s-arch-10 → 14 (8 Nov)
  - draft-ietf-tsvwg-ecn-l4s-id-18 → 22 (8 Nov)
  - draft-ietf-tsvwg-aqm-dualq-coupled-16 → 19 (3 Nov)
  - apologies for lack of usual summaries of diffs, and for JIT posting

- Diffs (next slides):
  - normative
  - technical
  - editorial

	Gorry	PeteH	Jake	Stuart	Sebastian	Ermin	Mirja	Phil	Neal	Praveen	Chairs	Authors
l4s-arch	√	√	√	√		√	√	√	√	√		√
l4s-id	√	√	√	√	√	√	√				√	√
dualq	√	√				√	√		!			√

Draft updates: L4S Architecture
l4s-arch-10 -> 14 (8 Nov)

- Normative – n/a

- Technical – none?

- Editorial
    - New "Document Roadmap" section
    - New start to "Architecture Overview"
    - Clarified explanation of DualQ
    - Expanded "Traffic Rate (Non-)Policing"
    - More Specifics in "Interactions with Rate Policing"
    - References for assertions & removed more controversial words

Draft updates: ECN Protocol for L4S
ecn-l4s-id-18 -> 22 (8 Nov)

- Normative
  - Prague req's (§4): Jake attempted to improve ECN AQM fallback
    - but more lax IMO (no change to normative text)
  - Guidance on Congestion Response in the RFC Series (§4.3.1)
    - where L4S does & doesn't comply [esp RFC4774], and justification if not (no new normative text)
  - Exception for Packet Identification if Transport-Aware AND ECN classification (§5.3)
    - ancient text, used to class CE as if ECT(0), if most recent ECT was ECT(0). Now only if *all* ECT(0)
  - Inclusion and Exclusion of additional traffic with L4S (§5.4.1.1 & §5.4.1.2):
    - The operator MUST NOT... → The process/node MUST NOT...
- Technical
  - Limiting Packet Bursts from Upstream Links – added section
  - Open Questions: Cross-refs to above new section and added Bursty Traffic question
- Editorial
  - Lots, esp. added references for assertions & removed more controversial words

Draft updates: DualQ Coupled AQMs for L4S
aqm-dualq-coupled-16 -> 19 (3 Nov)

- Normative - none

- Technical

    - Improved explanation of need for conditional scheduler

    - Updated referenced PI2 Parameters paper

    - Described potential bursty traffic problem & potential solution (Appx A)

    - Guidelines on RTT-independence & choosing coupling factor, k (Appx C)
        - wrote up maths that had been in a referenced paper, but needed correcting

- Editorial

    - Lots

Next Steps

- Follow-ups to draft changes in response to WGLC comments
  - then …? (dependent on chairs' assessment of position)

- Expected work in parallel to approval process:
  - Scalable CC algorithm improvements,
    - esp. flow start and integrating delay with ECN & loss metrics
  - Investigate interaction with bursty traffic
  - Progressing l4sops
  - Reporting performance results from L4S experiments
  - Tracking deployment status of L4S

L4S Status Update

Thank you to all those who contributed to the WGLC, and to those still contributing to list discussion

Q&A

Normative updates to ecn-l4s-id
(see online for full diffs)

- Exception for Packet Identification if Transport-Aware AND ECN classification (§5.3)

  - if an L4S network node classifies packets by their transport-layer flow ID **and their ECN field**, and if **all** the ECT packets in a flow have been ECT(0), the node MAY classify any CE packets in the same flow as if they were Classic ECT(0) packets. In all other cases, a network node MUST classify all CE packets as if they were ECT(1) packets.

- Inclusion and Exclusion of additional traffic with L4S (§5.4.1.1 & §5.4.1.2):

  - The **process** of including additional traffic with L4S only involves reading identifiers such as those itemized above. It MUST NOT alter these non-ECN identifiers,...

  - A **network node** that supports L4S but excludes certain traffic carrying the L4S identifier from L4S treatment MUST NOT treat such traffic as if it carries the ECT(0) codepoint,...