L4S Status Update

draft-ietf-tsvwg-l4s-arch-14
draft-ietf-tsvwg-ecn-l4s-id-22
draft-ietf-tsvwg-aqm-dualq-coupled-19

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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

<table>
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<tr>
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<th>(1) Today (typical)</th>
<th>(2) Today (at best)</th>
<th>(3) Unacceptable</th>
<th>(4) L4S</th>
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<tr>
<td>Bottleneck</td>
<td>Bloated drop-tail buffer</td>
<td>AQM</td>
<td>Shallow AQM</td>
<td>Immediate AQM</td>
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<tr>
<td>Sender CC</td>
<td>Classic</td>
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<td>Scalable (tiny saw-teeth)</td>
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- (1) Today (typical)
- (2) Today (at best)
- (3) Unacceptable
- (4) L4S

- Sender CC: Classic, AQM, Classic, Scalable (tiny saw-teeth)

- Bottleneck: Bloated drop-tail buffer, AQM, Shallow AQM, Immediate AQM

- Buffer occupancy: TCP saw-teeth seeking capacity
- AQM target
- Link utilization: even less buffer, consistently low queuing delay
- Time: no delay but poor utilization, full utilization, insensitive to target
Recent L4S-Related News

- Pete Heist's continuing 'red team' testing & evaluation
  - [https://github.com/heistp/l4s-tests/#readme](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
    - `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

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<tr>
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<th>Gorry</th>
<th>PeteH</th>
<th>Jake</th>
<th>Stuart</th>
<th>Sebastian</th>
<th>Ermin</th>
<th>Mirja</th>
<th>Phil</th>
<th>Neal</th>
<th>Praveen</th>
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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 I4sops
  - 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,...