Second IETF L4S Interop @ IETF Hackathon

IETF 115
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London, UK

Champions: Greg White (CableLabs), Koen De Schepper (Nokia)

Hackathon/Interop Plan

Low Latency, Low Loss and Scalable Throughput (L4S)

- L4S Congestion Control & AQM Architecture
  - draft-ietf-tsvwg-l4s-arch (RFC-to-be 9330)
  - draft-ietf-tsvwg-ecn-l4s-id (RFC-to-be)
  - draft-ietf-tsvwg-aqm-dualq-coupled (RFC-to-be)
- Accurate ECN for TCP (QUIC supports accurate ECN natively)
  - draft-ietf-tcpm-accurate-ecn
- L4S involves three components
  - Congestion control @ sender
  - Congestion marking @ bottleneck
  - Marking feedback @ receiver

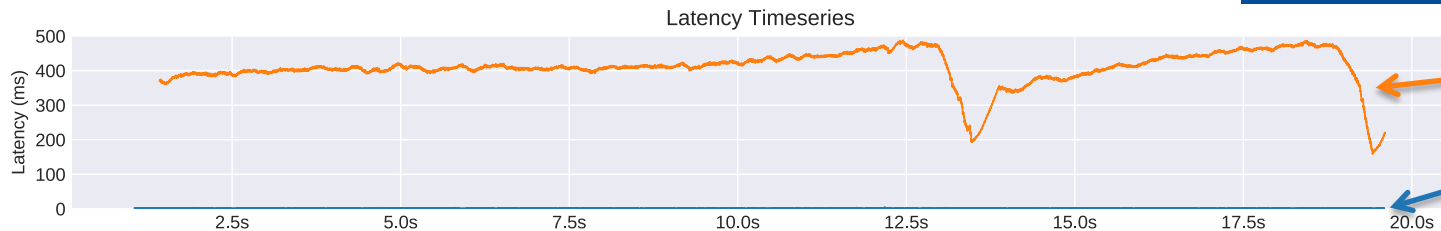# Hackathon Implementations

- Congestion control
  - Apple QUIC Prague
  - Linux TCP Prague
  - Google BBRv2
  - Nokia RT-Prague
  - Ericsson SCReAM

- Marking Feedback
  - Apple QUIC
  - Linux AccECN/TCP
  - FreeBSD AccECN/TCP
  - Nokia RT-Prague
  - Ericsson SCReAM

Hackathon Implementations

- Four bottleneck link implementations
  - Nokia Beacon 6 WiFi AP
  - Nokia 5G Network (emulated RF)
  - Nokia Fixed Network Emulator
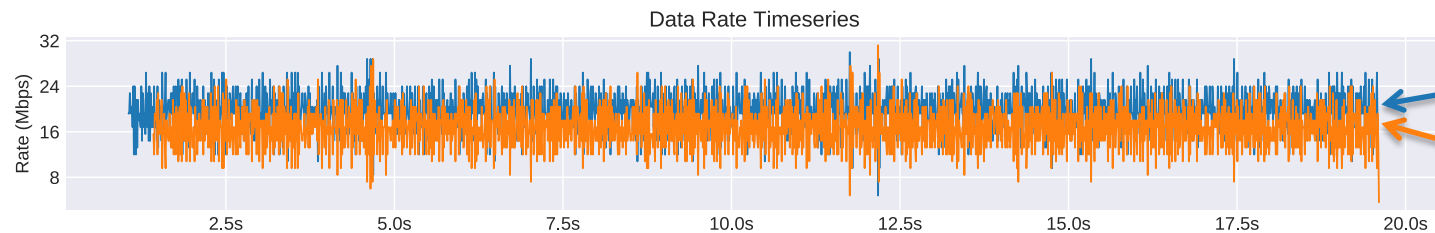 - Ericsson 5G Network (test license)

What got done, so far…

- Interop testing of Ericsson SCReAM, Nokia RT-Prague & TCP Prague on Nokia L4S WiFi, Nokia 5G-RAN & Ericsson 5G-RAN

- One Nokia RT-Prague with 100 TCP Prague flows on one 5G UE (every flow got ~1.5 Mbps)

- Apple L4S QUIC on 5G RAN

- ToDo:
  - Apple L4S QUIC on Nokia WiFi
  - Interop testing of Apple L4S QUIC & Nokia RT-Prague
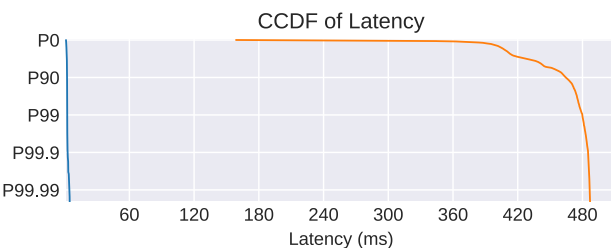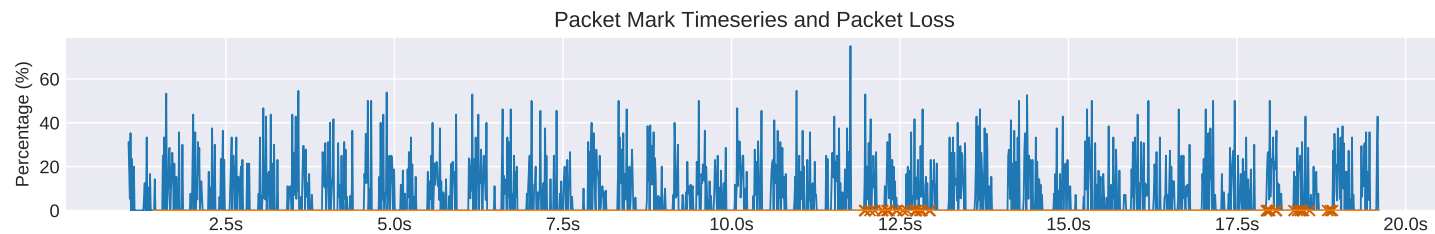 - Etc..

5G RAN Testing

Latency Timeseries

Destination 192.168.8.179
Destination 192.168.8.167

Classic Latency

L4S Latency

Data Rate Timeseries

L4S Thruput

Classic Thruput

Packet Mark Timeseries and Packet Loss

CCDF of Latency

	192.168.8.179	192.168.8.167
P50/P90/P99	1.777/2.243/2.361	409.976/464.618/479.875
P99.9/P99.99	2.779/4.241msec	485.212/486.900msec
Packet loss	0.00%(0/30013)	0.19%(50/25801)
Packet NoECT	0.00%(0/30013)	0.00%(0/25296)
Packet ECT_0	0.00%(0/30013)	100.00%(25296/25296)
Packet ECT_1	92.42%(27738/30013)	0.00%(0/25296)
Packet mark	7.58%(2275/30013)	0.00%(0/25296)
Avg rate	19.426Mbps	16.688Mbps

P99 Latency
L4S: 2.3 ms
Classic: 479.9 ms

Participating Organizations (11)

Apple
CableLabs
Domos
Ericsson
Google
Independent

Liberty Global
Nokia
Netapp
Virgin Media O2
Vodafone

Participants (20)

Peter Bergvik

Bob Briscoe

Neal Cardwell

Chia-Yu Chang

Stuart Cheshire

Ashutosh Das

Koen De Schepper

Vidhi Goel

Ingemar Johansson

Damian Johnstone

Mikael Langvall

Loba Olopade

Ameer Parab

Felipe Plaza

Richard Scheffenegger

Kevin Smith

Johan Strand

Craig Taylor

Bjørn Teigen

Greg White

Upcoming Interop Opportunities

- Second CableLabs L4S Interop – Denver, January 2023

- Third IETF L4S Interop (IETF 116) – Yokohama, March 2023

- Interested participants contact:

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