# Internet Research Task Force (IRTF)

# Measurement and Analysis for Protocols (MAPRG)

***-- Comparative Latency Under Load Performance of Broadband CPE --***

Lightning Talk
30 July 2021

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# Latency Matters!

Broadband performance isn't just about speed… Working latency REALLY matters!

# Working Latency: Comparing with and without AQM during COVID-19

Just prior to the pandemic in early 2020, Comcast deployed a large-scale network performance measurement system:

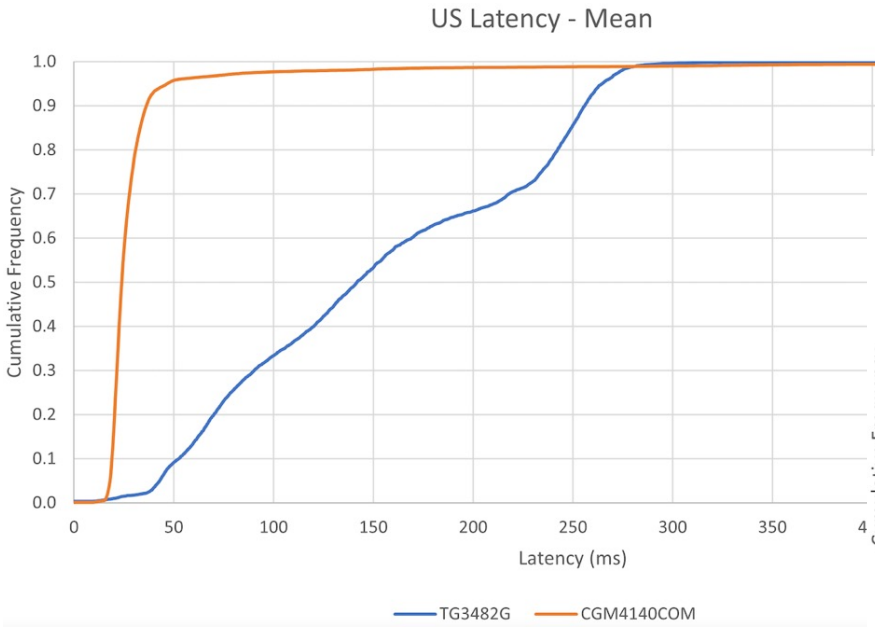
- Includes a latency under load (working latency) test, leveraging iperf3 & netperf
- Runs ~700,000 tests/day

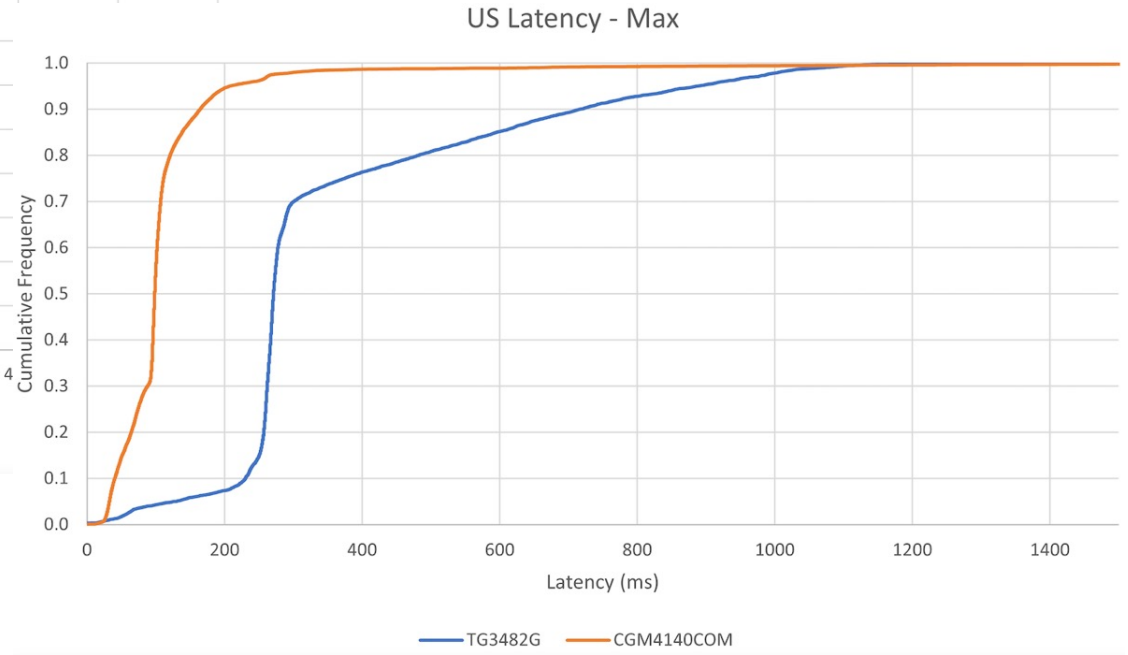
AQM (DOCSIS-PIE) is a feature of DOCSIS 3.1, but in initial deployments of D3.1 not every implementation was working properly. In one case, one specific cable modem that was produced to a common hardware specification by two different vendors and one had AQM enabled and one did not (upstream queue). As well, AQM was enabled during the measurement period on the CMTS (downstream queue).

We performed testing & analysis of this fortuitous confluence of events to produce a comparative analysis of the performance of AQM in a broadband network, across many months of time of extraordinary usage, and covering millions of devices.

# Comparative Working Latency Measurements – Upstream Queue

Data reveals significantly better latency under load performance (~90%) with AQM at scale



# Recommendations

Dramatically lowering working latency improves the QoE of most user applications today, including better latency consistency (lower jitter). Very low latency networks in the future will enable the creation of new classes of application.

These large-scale measurement comparisons should provide additional data to justify future deployment of AQM by ISPs and customer premise equipment manufacturers.

This may be of interest to people working on the Low Latency, Low Loss Scalable Throughput (L4S) protocol or other TCP/UDP congestion controls.

As the technical community's focus on working latency intensifies, there is an opportunity to better standardize/define how working latency is measured.

Also highlights a need for open global internet measurement platforms to focus on working latency (or create new platforms & beyond access network segments) and/or sharing of such measurement data.

# THANK YOU

Independent review of the measurement system & results: https://www.netforecast.com/wp-content/uploads/Comcast-Design-Audit-Report-NFR5133F.pdf and https://netforecast.com/wp-content/uploads/Comcast-Phase-II-Audit-Report-NFR5134F.pdf

Working latency paper available at: https://arxiv.org/abs/2107.13968