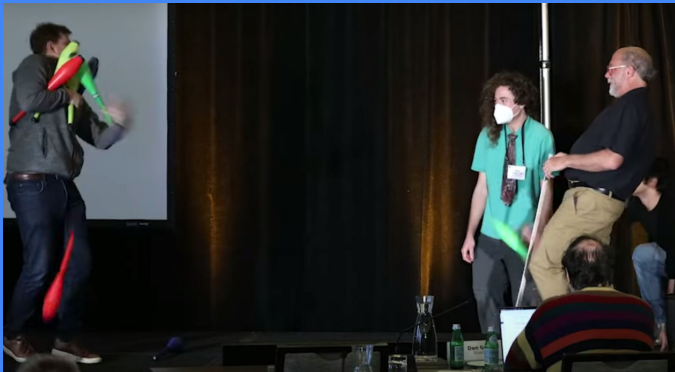(Slightly less)

A grumpy look at latency

Dave Taht
Chief Science Officer
LibreQoS
dtaht@libreqos.io

https://blog.apnic.net/2020/01/22/bufferbloat-may-be-solved-but-its-not-over-yet/

The tide is turning

https://www.youtube.com/watch?v=TWViGcBlnm0&t=1080s

CAKE & fq_codel getting ubiquitous

Fq_codel is now a commodity in the WISP market!

Billions of implementations on everything.

Don't have to change the whole internet (unlike L$S), just add flow queuing to multiplex everything together better, and AQM to keep the queues short. Most flows are low rate, and automatically experience near zero delay.

FQ provides protections from misbehaved or excessively greedy flows.

FQ Completely mitigates the side effects of "Slow Start".
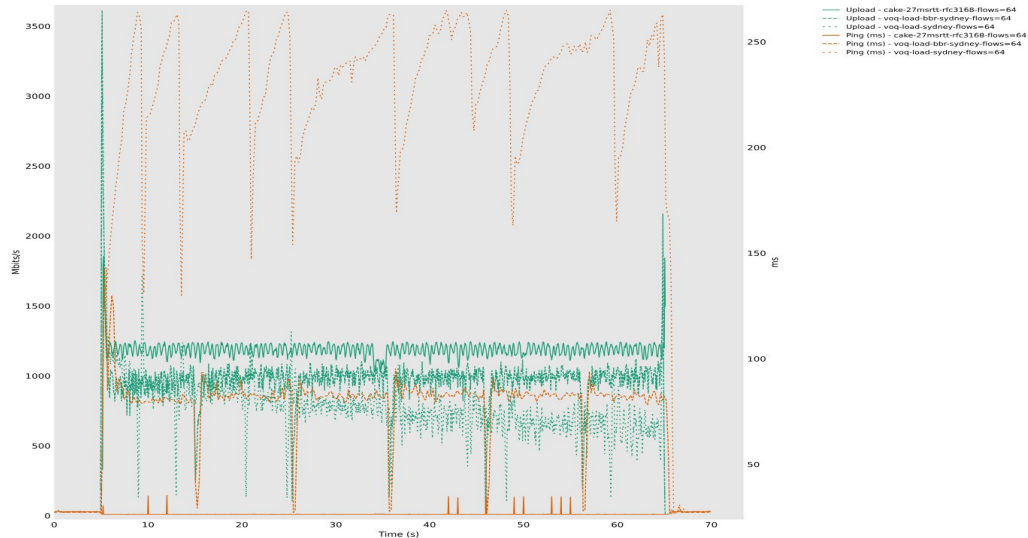
Bandwidths universally going up

But it's a big internet! Along the rural edges and the global south, sub-25Mbit speeds are still common... and the only drivers for more are things like cloud gaming.

Peak Average subscriber usage, no matter the underlying "speed", is 3-5Mbits (driven entirely by video downloads - about 1 in 6 watching video ar peak)

The efficiency of lowered latencies obvious

TCP upload - N streams w/ping
Bandwidth and ping plot

Legend:
- Upload - cake-27msrtt-rfc3168-flows=64
- Upload - voq-load-bbr-sydney-flows=64
- Upload - voq-load-sydney-flows=64
- Ping (ms) - cake-27msrtt-rfc3168-flows=64
- Ping (ms) - voq-load-bbr-sydney-flows=64
- Ping (ms) - voq-load-sydney-flows=64

Local/remote: lqos.taht.net/b1250-b1250.27ms - Time: 2023-02-17T10:25:34.227585 - Length/step: 60s/0.05s

Any ISP can have consistent latency today with LibreQoS

Leveraging the CAKE set of FQ+AQM algorithms

A Xeon 20 core can shape 25Gbit for 10k subscribers at 50% cpu on any given network segment, or on a model of a more complicated network. $.30/sub of CAPEX! No need to upgrade routers or protocols. (It does help to put cake on the CPE up, and fq_codel on the wifi)

It takes about an hour to setup LibreQoS; A couple weekends to integrate it.

Libre Software - Open Source - A "Long term Stats" module that is SaaS

LibreQoS Long-Term Stats (LTS)

"Tracking long-term latency is important. From a science perspective, you can see trends and measure the effects of latency mitigation techniques. From an operator point of view, latency is an excellent proxy for user experience. Long-term stats accurately measures TCP round-trip-time for actual customer data, giving an excellent long-term view - and letting you find the customers who are having a poor experience before they call you"?
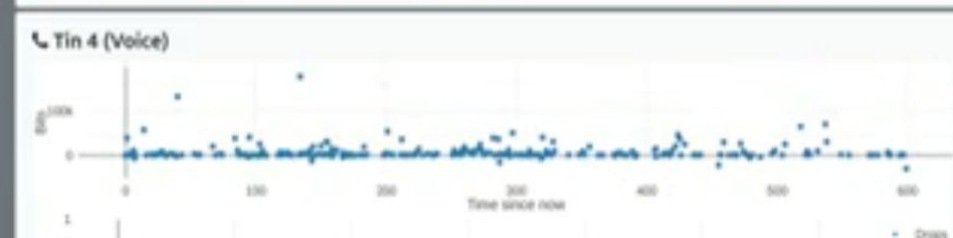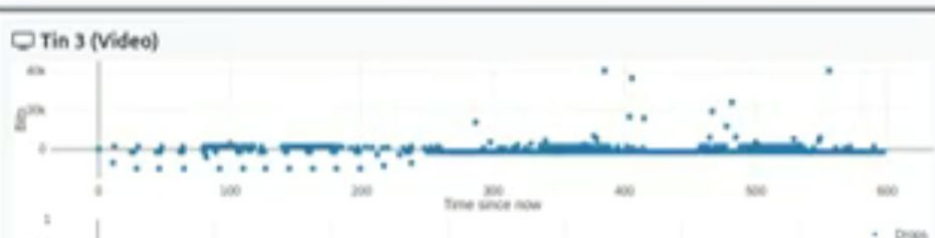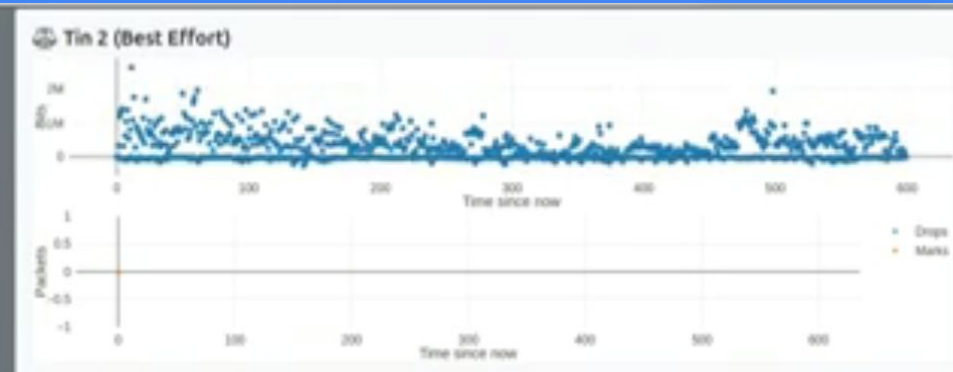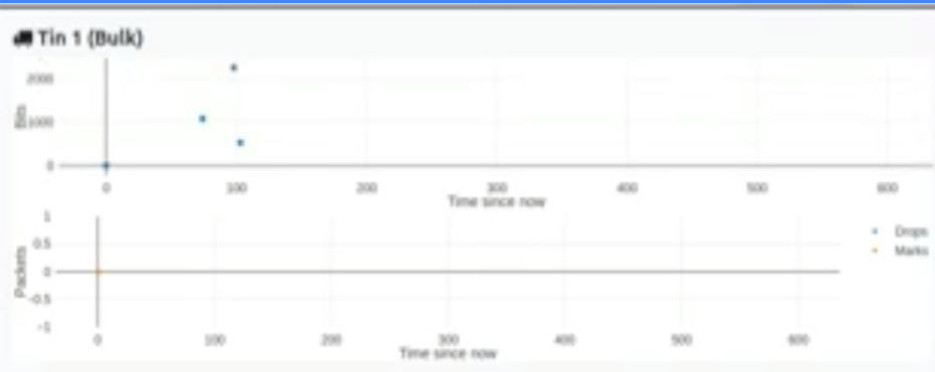
But what is network quality, anyway?

Is it finding a flow? Is it becoming part of the process? Is it the absence of pain points? The silence of support calls?
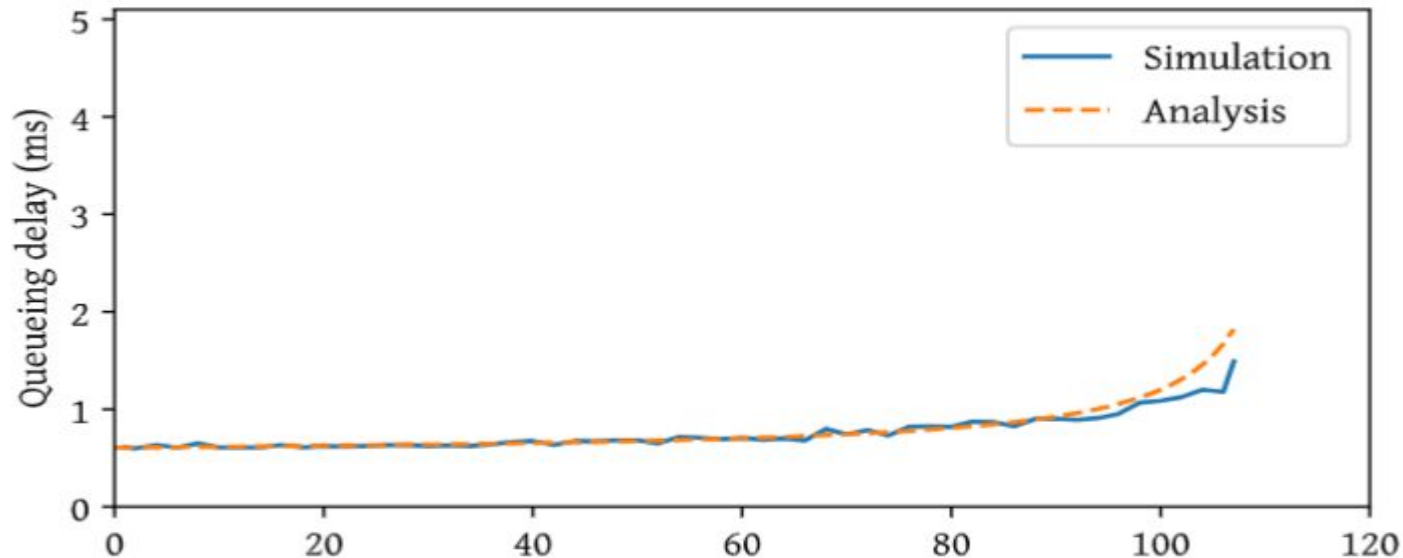
What's a packet?

What is the difference between a good network experience and a bad one?

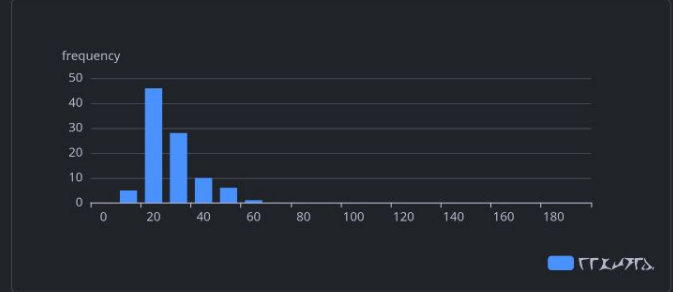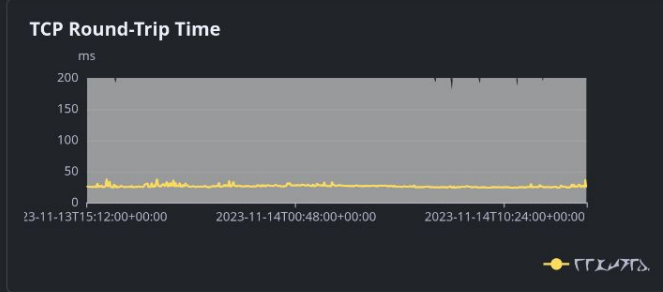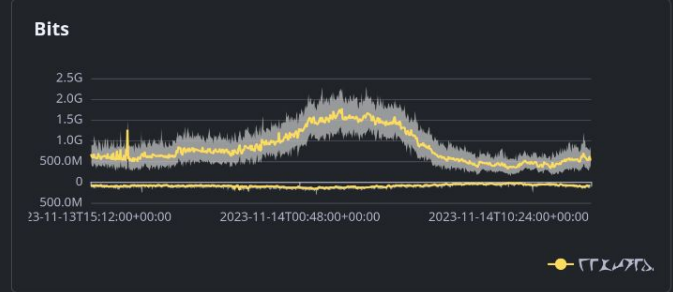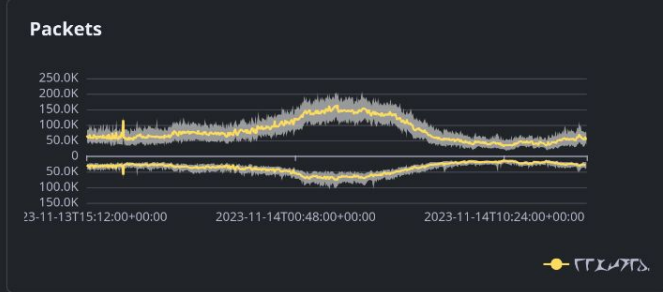# What does traffic really look like at the ISP?

Most flows are really short
# Mice outrun the elephants

(a) No bulk flows

24h

Search

Shaper Node: ⟨foreign script⟩

CPU Usage

%
70
60
50
40
30
20
10
0
23-11-13T15:12:00+00:00   2023-11-14T00:48:00+00:00   2023-11-14T10:24:00+00:00

RAM Usage

%
35
30
25
20
15
10
5
0
23-11-13T15:12:00+00:00   2023-11-14T00:48:00+00:00   2023-11-14T10:24:00+00:00

Packets

250.0K
200.0K
150.0K
100.0K
50.0K
0
50.0K
100.0K
150.0K
23-11-13T15:12:00+00:00   2023-11-14T00:48:00+00:00   2023-11-14T10:24:00+00:00

Bits

2.5G
2.0G
1.5G
1.0G
500.0M
0
500.0M
23-11-13T15:12:00+00:00   2023-11-14T00:48:00+00:00   2023-11-14T10:24:00+00:00

TCP Round-Trip Time

ms
200
150
100
50
0
23-11-13T15:12:00+00:00   2023-11-14T00:48:00+00:00   2023-11-14T10:24:00+00:00

frequency
50
40
30
20
10
0
0   20   40   60   80   100   120   140   160   180

Navigation

- Dashboard
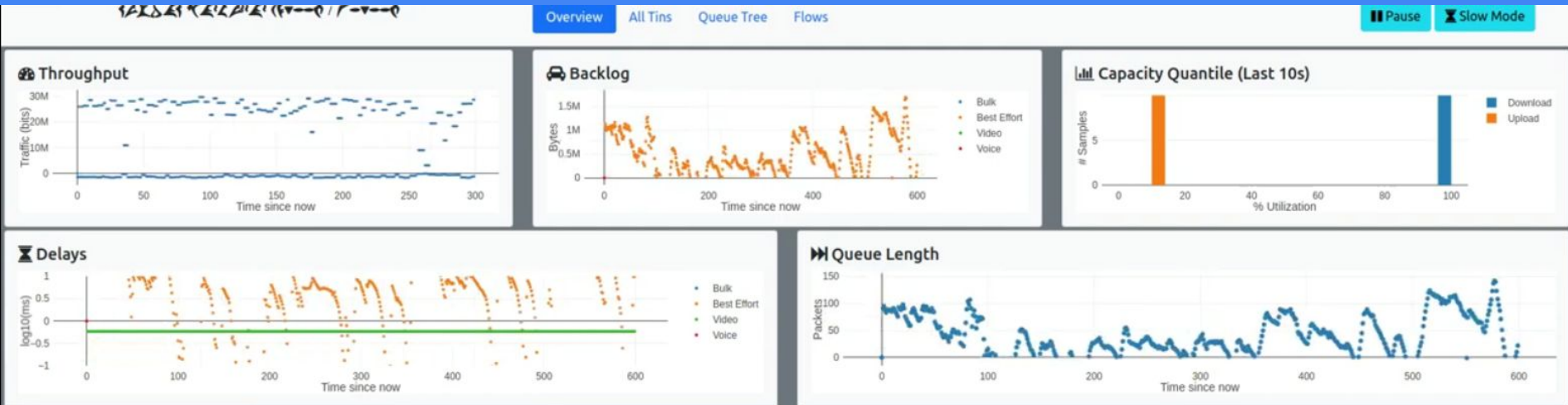- Shaper Nodes
- Site Tree
- Reports
- Possible Issues
- Logout
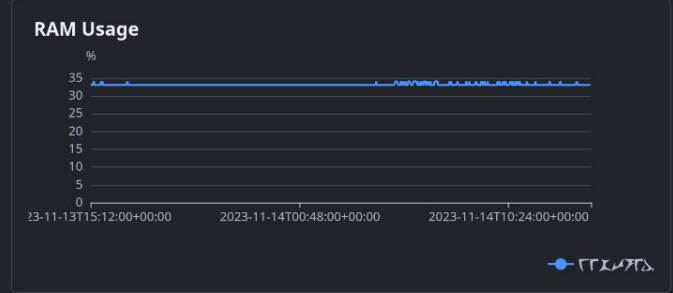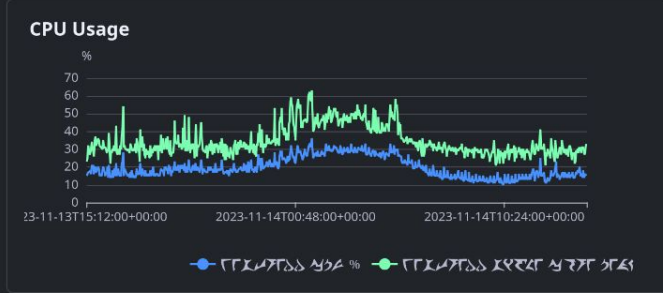
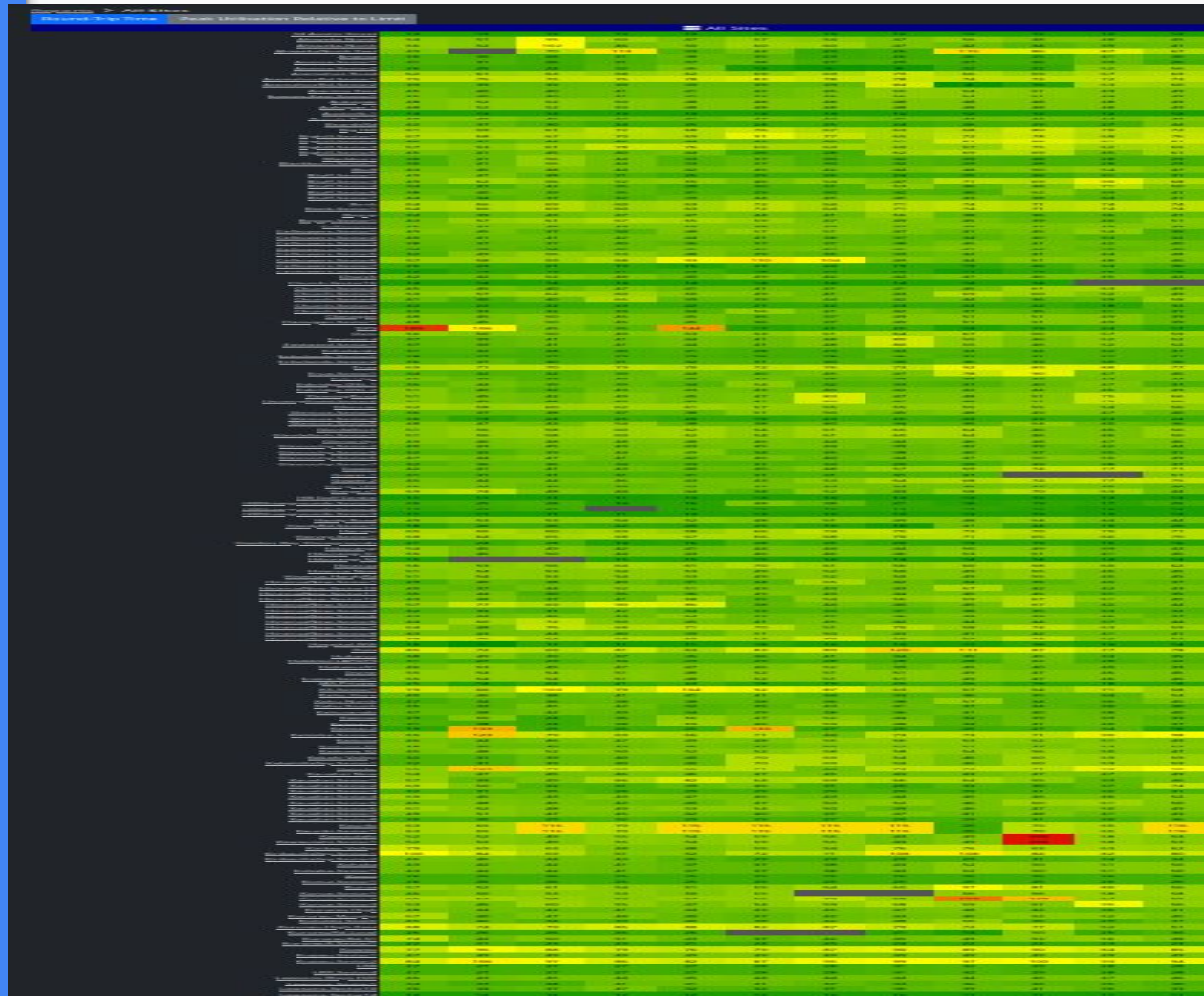# Netflix never gets out of slow start

15Mbits for 4k video
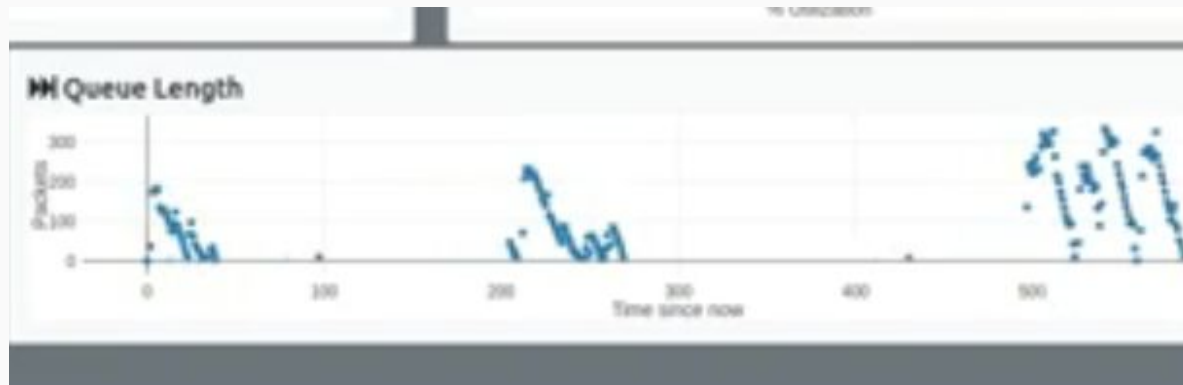
Amazon Prime Traffic

Solid TCP RTTs?

Everything in the green?

(except for squirrels, cut fiber, DDos attacks, bad applications, wifi problems, etc, etc)

Thanks!

Credits: NLNET, Equinix, Comcast Research, Google Fiber, OpenWrt & The Linux and BSD networking communities, the IETF, & our userbases across the planet

Join us in the chat!

https://app.element.io/#/room/#libreqos:matrix.org

www.bufferbloat.net
www.libreqos.io

Installation Statistics

LibreQoS is fixing the Internet, one ISP at a time.

Connections Debloated

356654 Shaped Devices
6970 Network Hierarchy Nodes

Tell the FCC that we need low latency!!