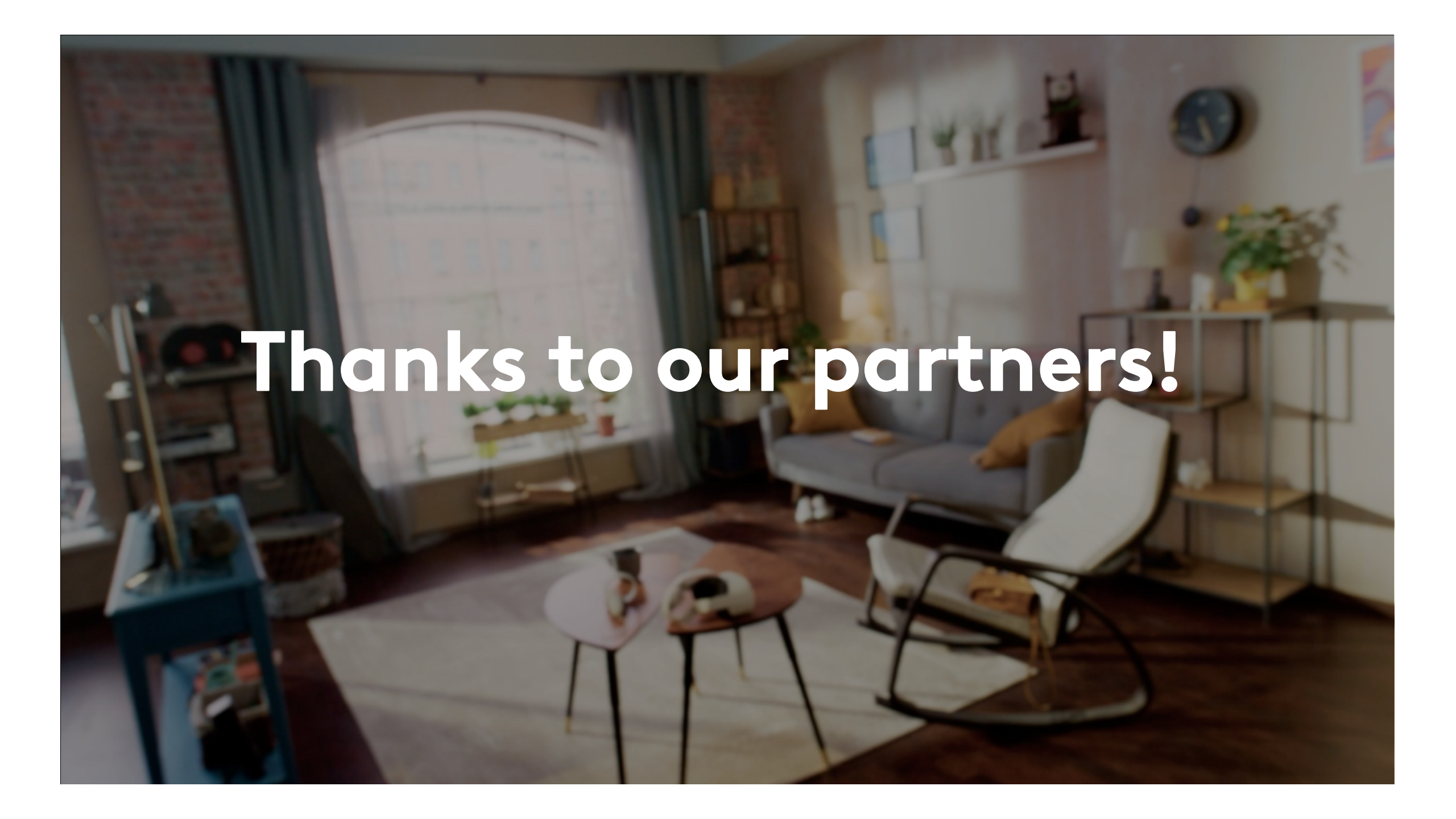




Dual Queue Low Latency Networking Update

IETF 121

November 2024



Thanks to our partners!

Deployment Has Begun!

APRIL

- Downstream testing added to upstream
- "Tech Ready" milestone reached

MAY - AUGUST

- Provisioning system preparation
- Refinement of bootfile configuration

SEPTEMBER - OCTOBER

- Oct 15: 3 PPODs Deploy to Production - Crawl
- Nov: 30 PPODs Deploy to Production - Walk
- +2 Weeks: 600,000 homes per week – Run
- Awareness
 - Frontline - Care, Sales, etc.
 - Tech Blog

NOV - JAN

- Expand to XB6

1Q2025

- Expand to COAM devices

*ELIGIBLE FOR LOW LATENCY SERVICE

TIER ELIGIBILITY

- Enhanced (Genesis in Phase I)
- X-Class (FDX) in Phase II

DEVICES

- **XB6**
- **XB7**
- **XB8**
- **FDX-Capable COAM**

Scaling Up - Phased Deployment

- Following standard operating procedures for big changes:
 - Crawl, walk, run phases
 - Deploy on small number of devices, soak-observe-analyze-decide
 - Widen deployment, soak-observe-analyze-decide
 - Full deployment – “foot on the gas” - soak-observe-analyze-decide & transition to normal ops
- We are in the crawl phase now, moving to walk and then run before EOY

Scaling Up - Phased Deployment

Monitoring includes a range of data, which is compared to baseline data to identify any divergences -- daily review of telemetry, operational stats, active & passive measurement data:

- Remote PHY stats
- vCMTS stats
- Modem health stats
- Gateway performance test stats (active measurement)
- vSG observed QoE (passive measurement)
- Customer contacts (calls, tickets, trouble calls, LL mentions)
- Layer 3 & Layer 7 IP network stats
- Partner QoE stats

Deployment Observations

- The technology is **READY TO SCALE**
- Downstream AQM deployment tied to L4S/NQB vCMTS code
 - Seeing DS LUL p99 down 50% **from 50 ms to 25 ms** (DS AQM code)
 - Introduction of DS AQM had *interesting* effects on an internal speed test tool – prompting some configuration changes
- Downstream and upstream L4S & NQB **performing as expected**
- Packet delay on CMTS interface
 - Classic queue: 1.9 ms avg / 31.5 ms max
 - LL queue: 0.95 μ s avg. / 61 μ s max
- Application developers report very positive QoE improvements

Next Steps

- Gradually widen scope of deployment
 - Add more CPE models
 - Continue to evangelize, help developers, help other ISPs
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- One more thing, as they say...



Questions?