



# Comcast's Dual Queue Low Latency Deployment Experiences

Understanding Latency  
December 2024





**Thanks to our partners!**

**And thanks to our core team:**

- Chad
- Jeff
- Mike
- Eric
- Leslie
- Takashi

# Deployment Has Begun!

## APRIL

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

## MAY - AUGUST

- Provisioning system preparation
- Refinement of bootfile configuration

## SEPTEMBER - OCTOBER

- Oct 15: "Crawl" with 20,000 Homes in Production
- Dec: "Walk" with 200,000 Homes in Production
- Jan: "Run" Add 600,000 homes per week, ending with **millions** of homes live

## DEC - JAN

- XB6 CPE
- XB7 CPE
- XB8 CPE

## 1Q2025

- Expand to COAM devices
- Prep for FDX expansion
- Build success cases with app partners

### \*ELIGIBLE FOR LOW LATENCY SERVICE

#### TIER ELIGIBILITY

- Enhanced 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 walk phase now, moving to run soon
- At the end of Phase 1 of deployment we will have over 4M homes

# 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:

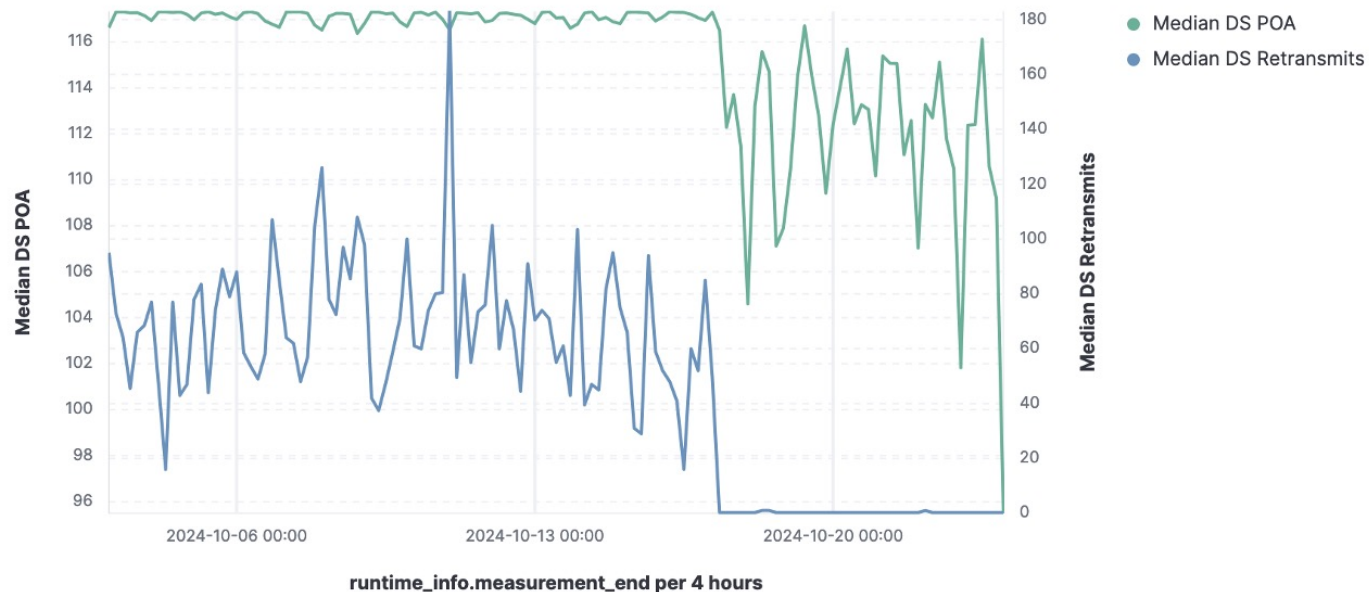
- Remote PHY stats
- vCMTS stats
- Modem health stats
- Gateway performance test stats (active measurement)
- vSG observed QoE (passive measurement)
- Customer contacts (calls, tickets, trouble calls, LL mentions)
- Layer 3 & Layer 7 IP network stats
- Partner QoE stats

# 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  $\mu$ s avg. / 61  $\mu$ s max
- Application developers report very positive QoE improvements

# Deployment Observations: AQM + Speed Test Parameter Problem

## MAAOPP201



Monitoring 1<sup>st</sup> noticed  
major change in  
retransmits

Speed oscillation not  
noticed on 3<sup>rd</sup> party  
tests; must be an  
issue with this tool

Conclusion: Duration  
of test was too short;  
add a few seconds

Problem solved;  
continue DS AQM  
deployment

# Next Steps

- Run phase: significantly widen scope of deployment
- Add more CPE models
- Continue to evangelize, help developers, help other ISPs
- Document success stories to help attract developer and ISP interest





**Questions?**