

T7 Latency Performance Updates

The logo for OpenDay 2025 is located in the top right corner. It features the text "OpenDay" in a large, white, sans-serif font, with "2025" in a smaller font directly below it. The text is enclosed within a circular graphic composed of several dashed white lines, giving it a digital or network-like appearance. The background of the slide is a dark blue gradient with glowing blue circuit-like lines and dots.

That Obscure Object of Latency

18 September 2025

T7 Highlights 2025

- T7 daily requests on April, 7th: 1.25 billion
 - Eurex: 460 million
 - Xetra: 759 million
- Boerse Frankfurt on April, 7th (separate T7 instance): 60 million
- Eurex quotes on April, 7th: 8.22 billion
- Xetra quotes on April, 7th: 806 million

T7 Highlights 2025

- T7 daily requests on April, 7th: 1.25 billion (vs. 857 million in 2023)
 - Eurex: 460 million (vs. 348 million in 2023)
 - Xetra: 759 million (vs. 487 million in 2023)
- Boerse Frankfurt on April, 7th (separate T7 instance): 60 million (vs. 54 million in 2022)
- Eurex quotes on April, 7th: 8.22 billion (vs. 5 billion in 2022)
- Xetra quotes on April, 7th: 806 million (vs. 514 million in 2023)

T7 Highlights 2025

- T7 peak input rate on June, 5th: 201 thousand/second
 - Eurex (March, 13th): 118 thousand/second
 - Xetra (April, 16th): 92 thousand/second
 - One Xetra partition (April, 16th): 20 thousand/second
 - One Eurex product (April, 9th): 16 thousand/second

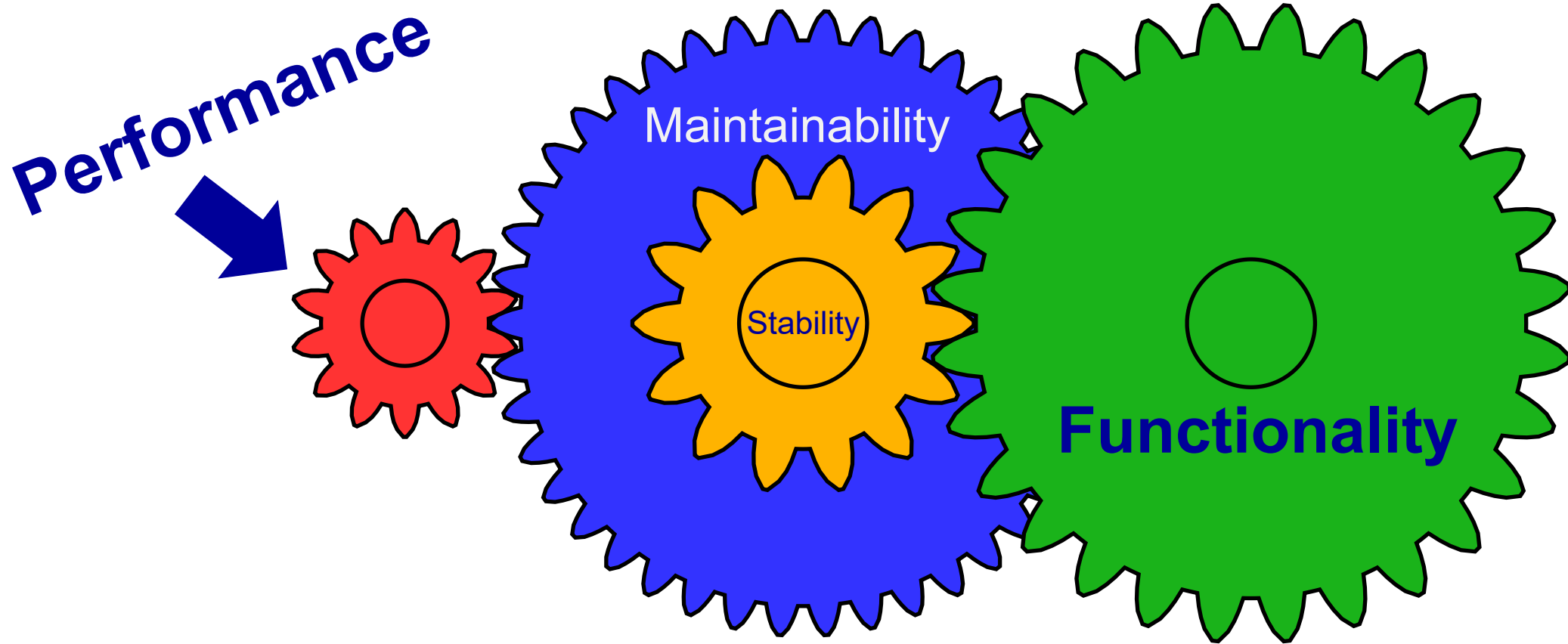
T7 Highlights 2025

- T7 peak input rate on June, 5th: 201 thousand/second (vs. 137 k/s in 2023)
 - Eurex (March, 13th): 118 thousand/second (vs. 76 k/s in 2023)
 - Xetra (April, 16th): 92 thousand/second (vs. 70 k/s in 2023)
 - One Xetra partition (April, 16th): 20 thousand/second (vs. 14 k/s in 2024)
 - One Eurex product (April, 9th): 16 thousand/second (vs. 9 k/s in 2023)

T7 Challenges

- More volume
- Higher input rates
- More functionality
- Less dramatic CPU performance increases

T7 as a Machine



Tech Refresh

Tech Refresh

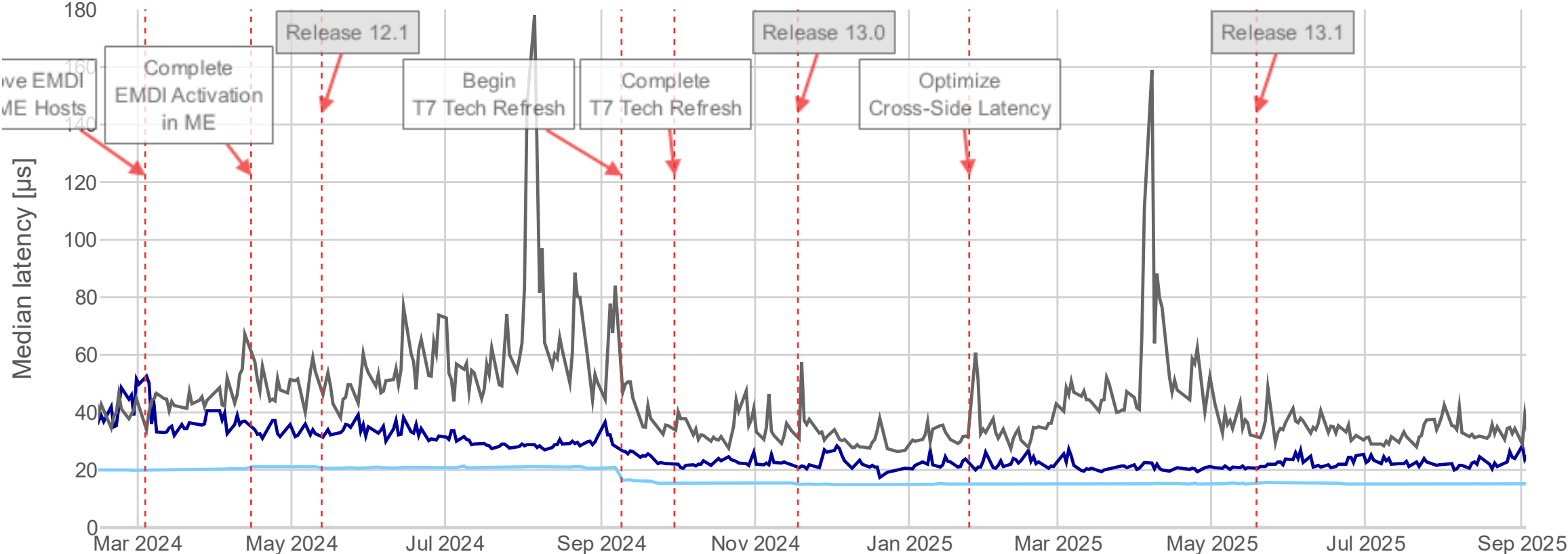
- End of 2024
- Infiniband to Ethernet
- 2 x 12 cores to 2 x 32 cores servers
- Hybrid PTP + SyncE

Tech Refresh - Results

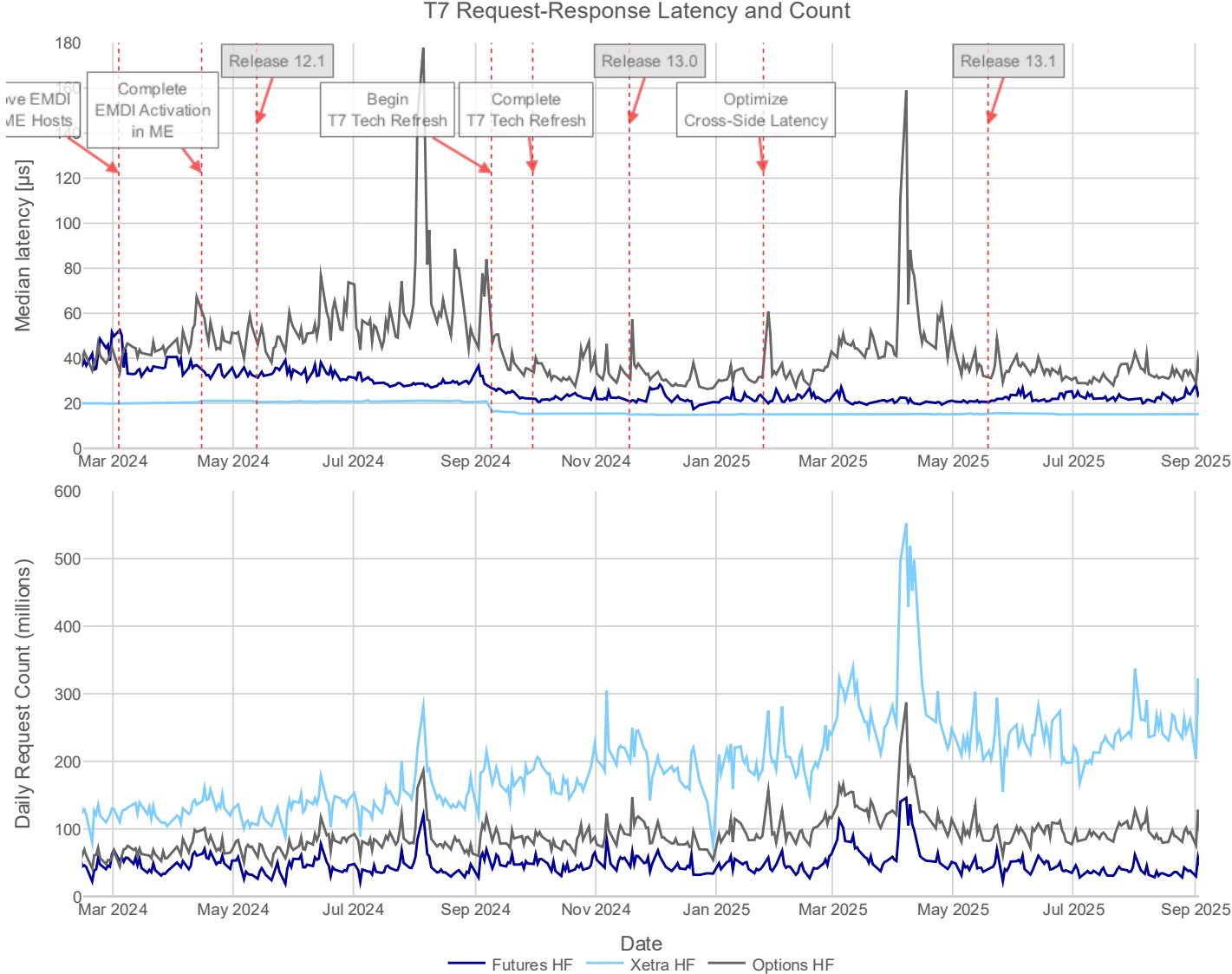
- Although nominally lower single core performance, increased performance due to:
 - Gateway/Matcher/Marketdata Publisher fit into one NUMA domain
 - Second socket free for the persistence layer
- Increased PTP performance, e.g. consistently between 4 and 5 ns RMS
 - For higher quality timestamps in our monitoring
- Increased stability due to Infiniband exit

Tech Refresh - Results

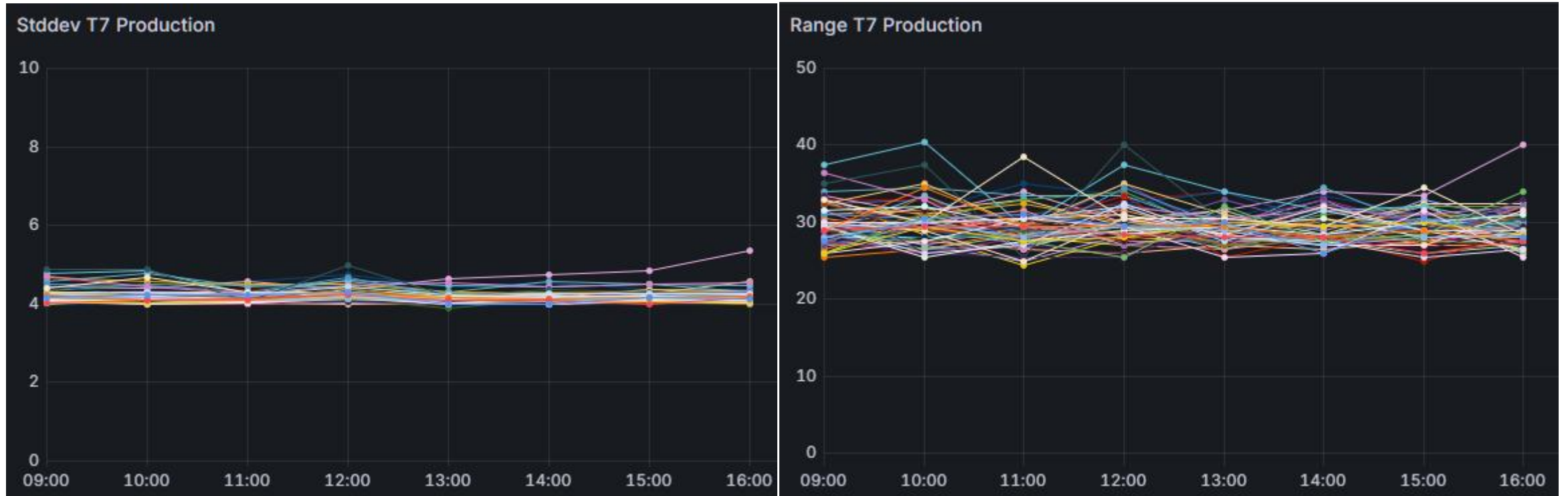
T7 Request-Response Latency and Count



Tech Refresh - Results



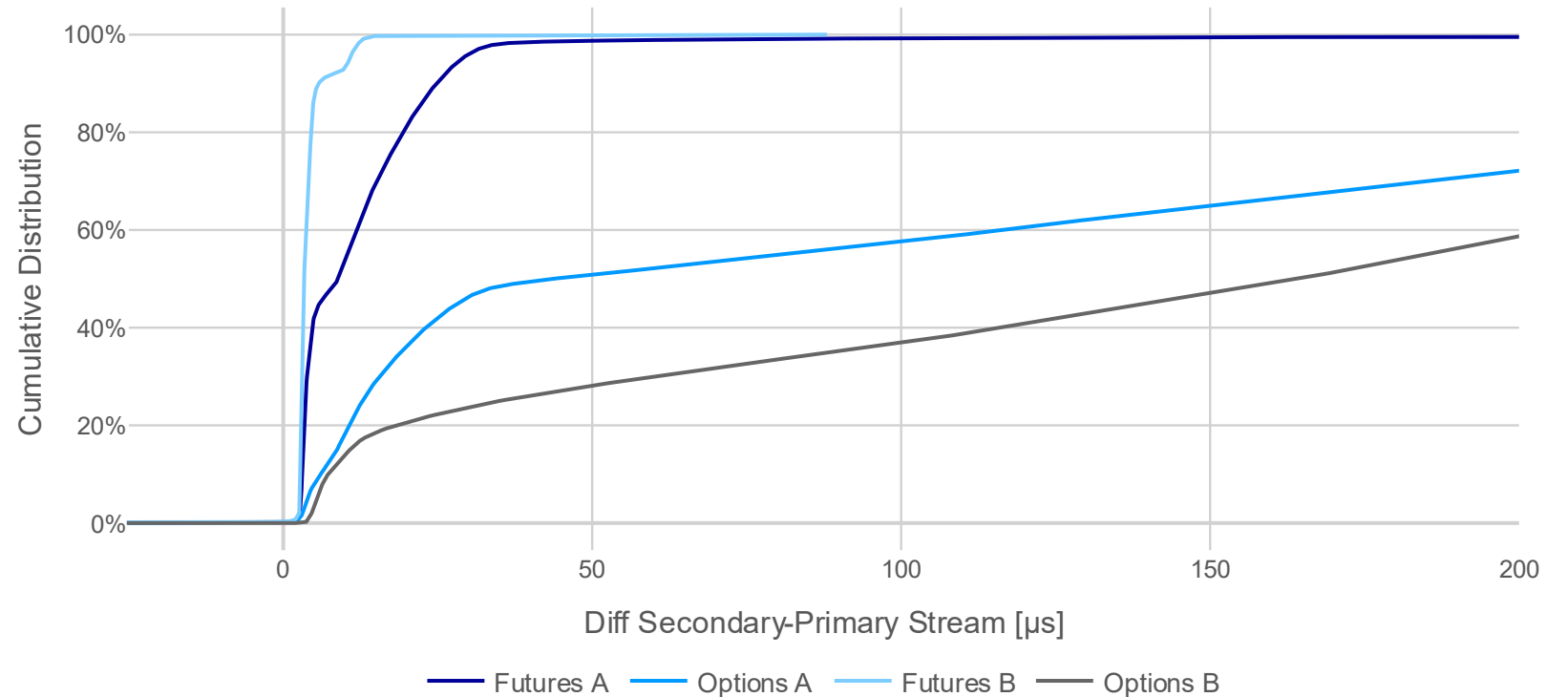
Tech Refresh - Results



(PTP performance on servers, y-axes in nanoseconds, one color per server)

Tech Refresh – EOBI Latency

- T7 market data paradigm:
 - Public before private
 - Primary EOBI stream before secondary (A vs. B)
- Since April: improvement of A/B differences

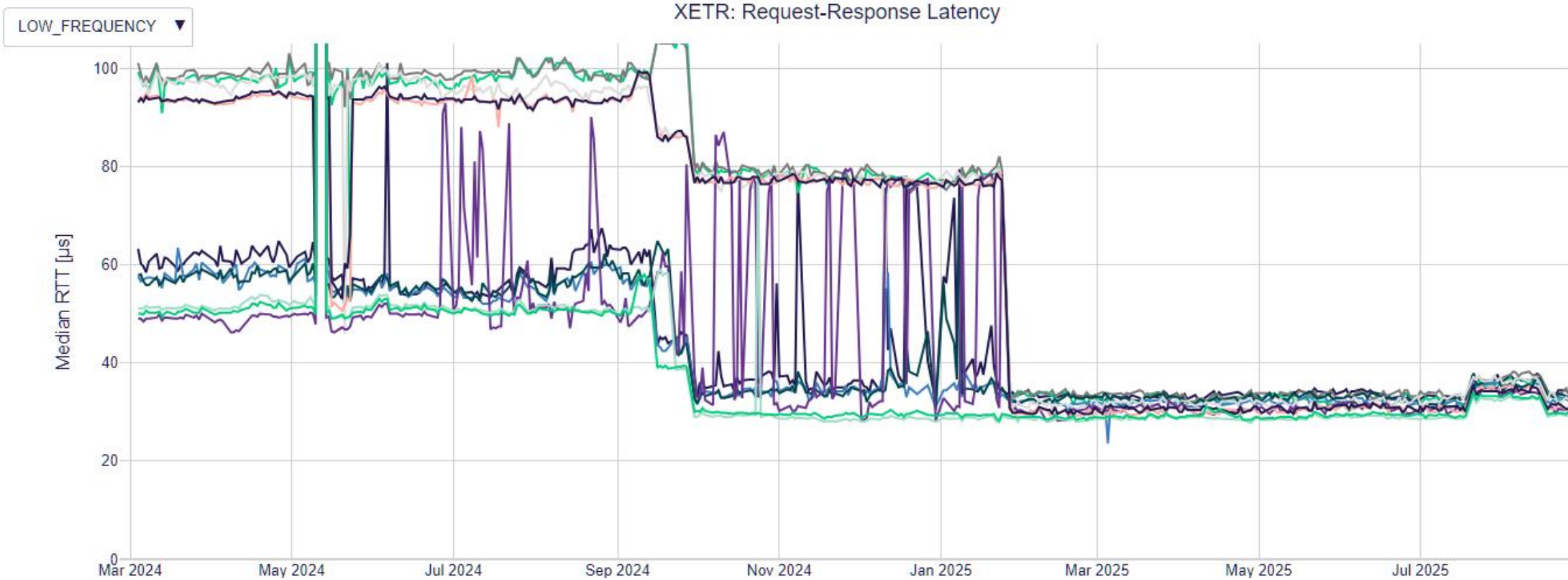


Tech Refresh – Per-Frame Timestamping

- Hardware receive timestamp (t_{3n}) for all TCP segments
- Quite a few edge cases to consider and test
- Started enabling this functionality begin of June

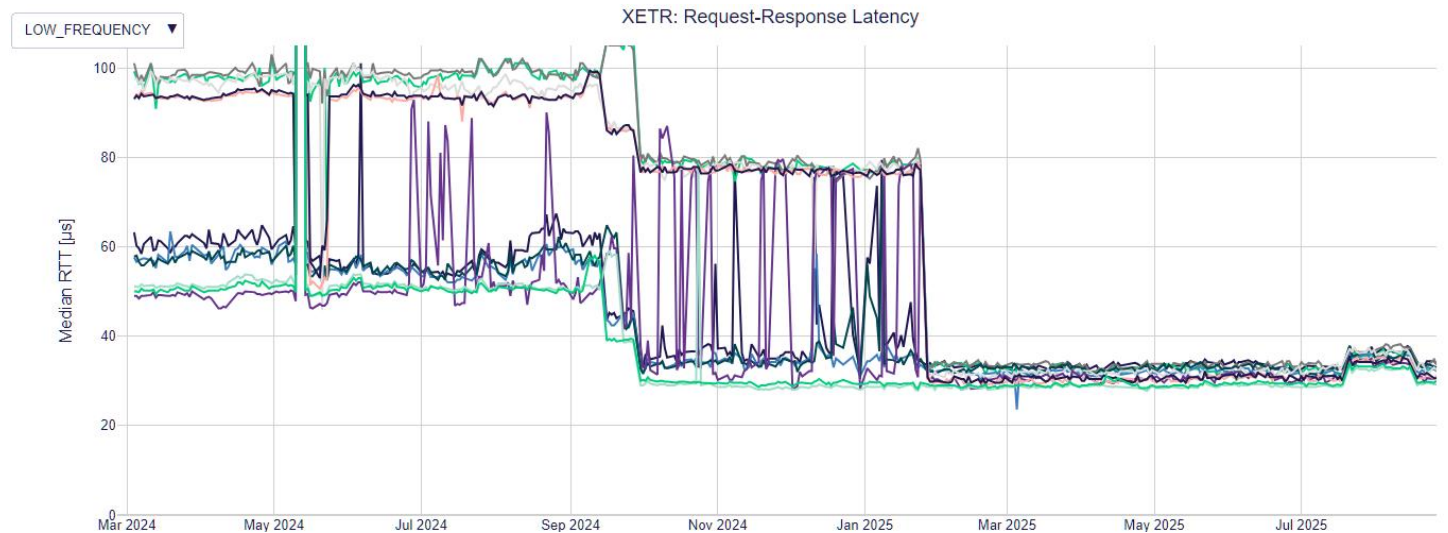
LF Gateway Latency

LF Gateway Latency



LF Gateway Latency

- What happened here?



- Cross-Room network connection improvements, end of January
- Hardware Receive Timestamping and kernel by-pass, since July
- Improved thread setup, since August

(different color,
different partition)

Congestion

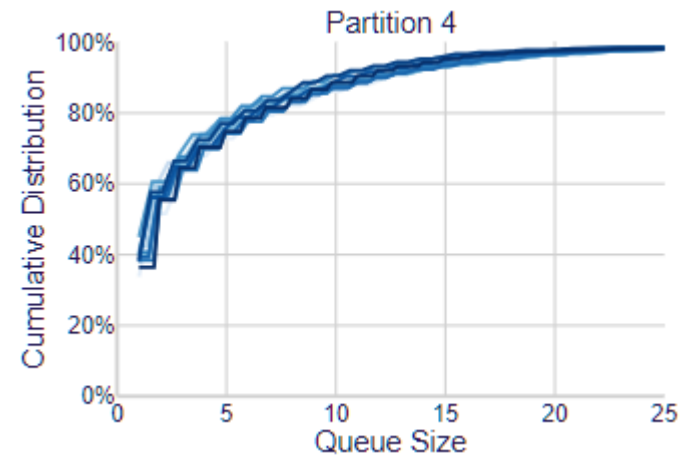
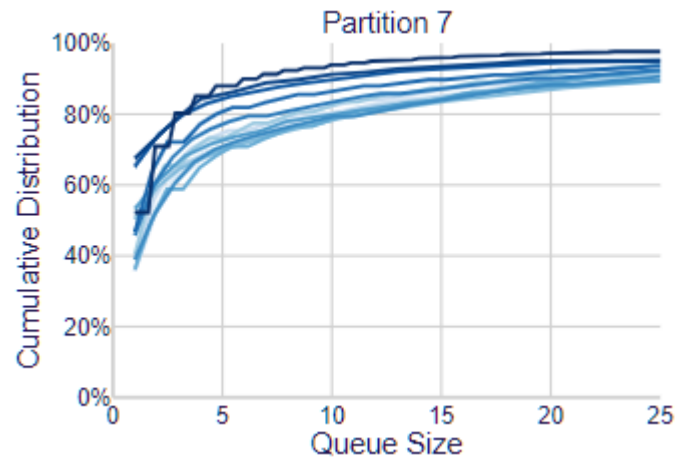
Congestion

- Monitoring throughput in T7
- Input rate greater than processing speed
 - -> transactions/updates are queued
- Goal: reduce congestion by optimizing software/setup



Congestion

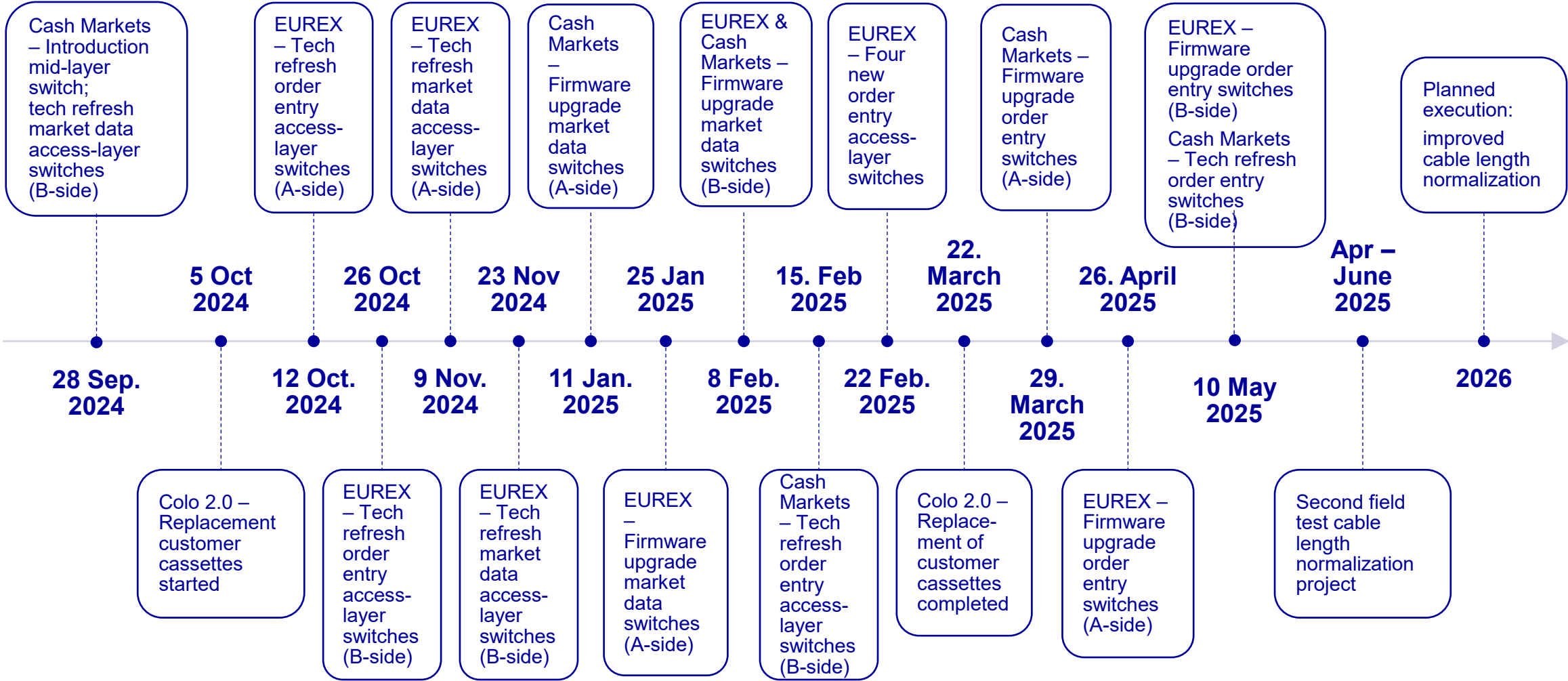
- Examples:



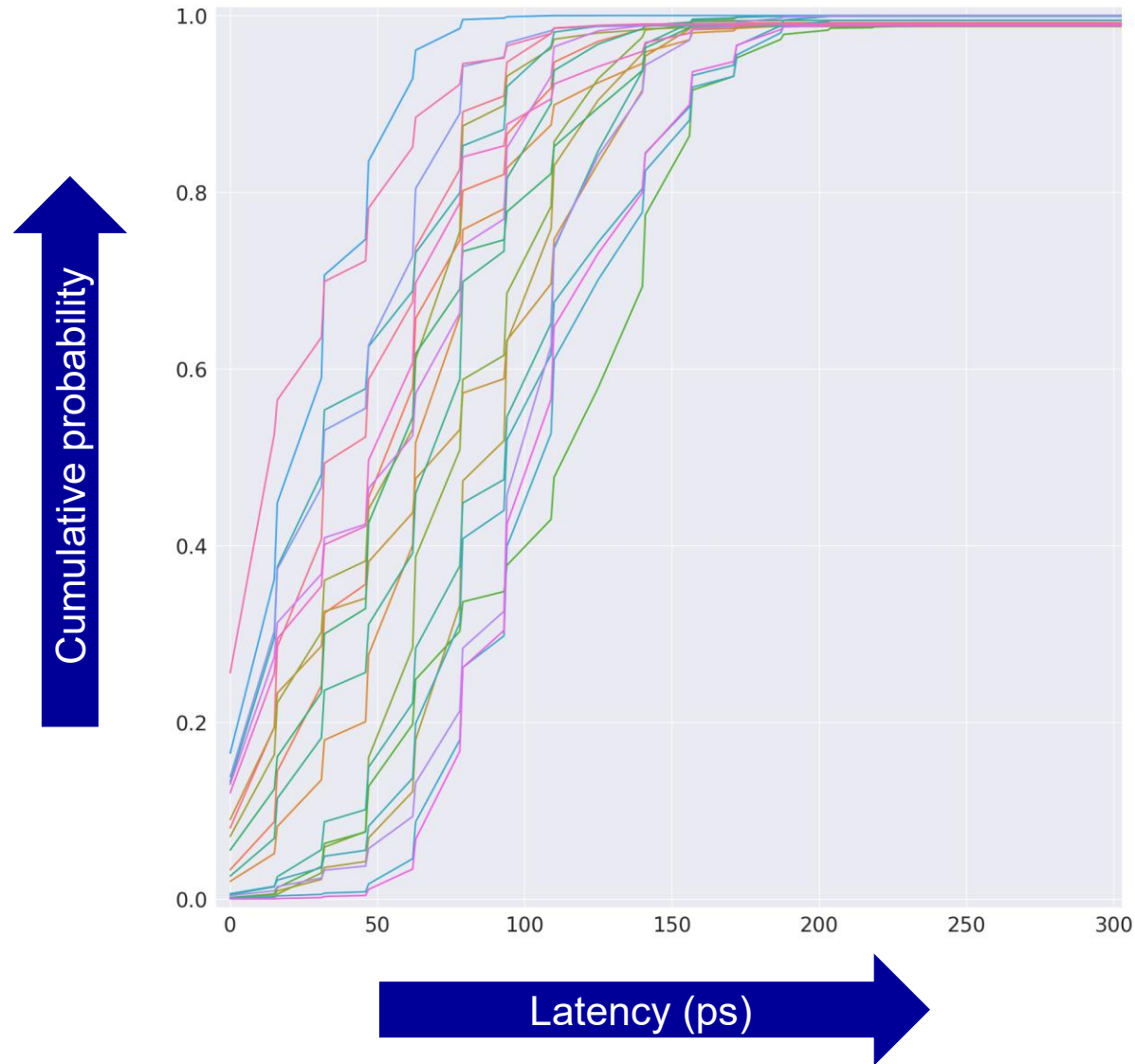
- Shows queueing in the matcher core
- Trend visible (one color per month, lighter -> older)

Colocation Updates

Colocation – Steps since last Open Day



Colocation – Market Data Port Differences



- Switch: Cisco 3550T
- Sample August, 2025
- One color per port
- Ports of one switch
- $\delta_{p,i} = t_{9a,p,i} - t_{9m,i}$
- $d_{p,i} = \delta_{p,i} - \min_q \delta_{q,i}$
- i : packet number
- p, q : port numbers
- t_{9m} : timestamp before switch
- t_{9a} : timestamp after switch

Conclusion

- Tech refresh worked out well
- In spite of volume increases T7 latency stays low
- After the tech refresh is before the next refresh



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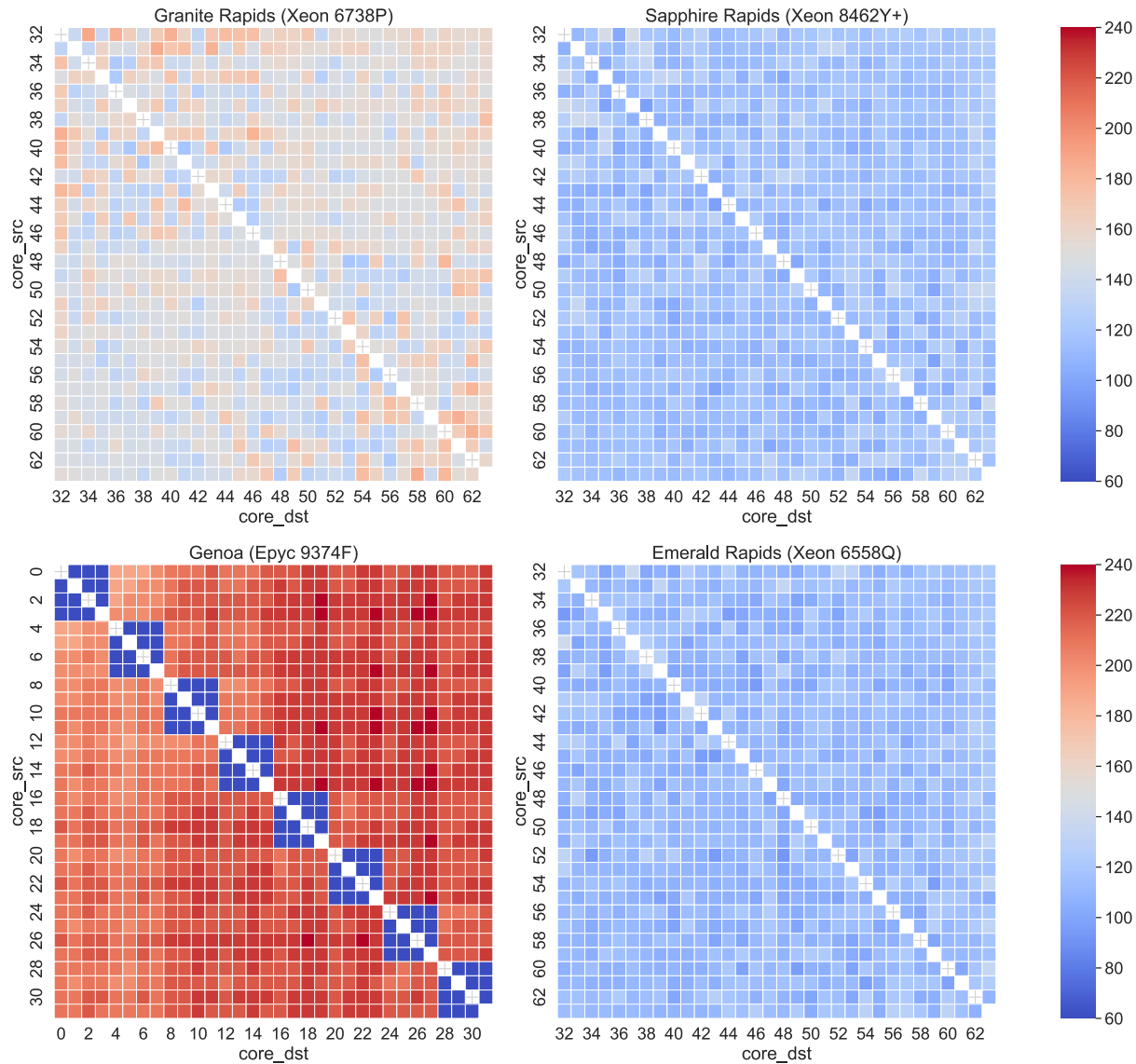
Outlook

- Even better clock synchronisation
 - SyncE down to the server
 - PTM
- Making T7 ready for chiplet CPU architectures
- Colocation improvements



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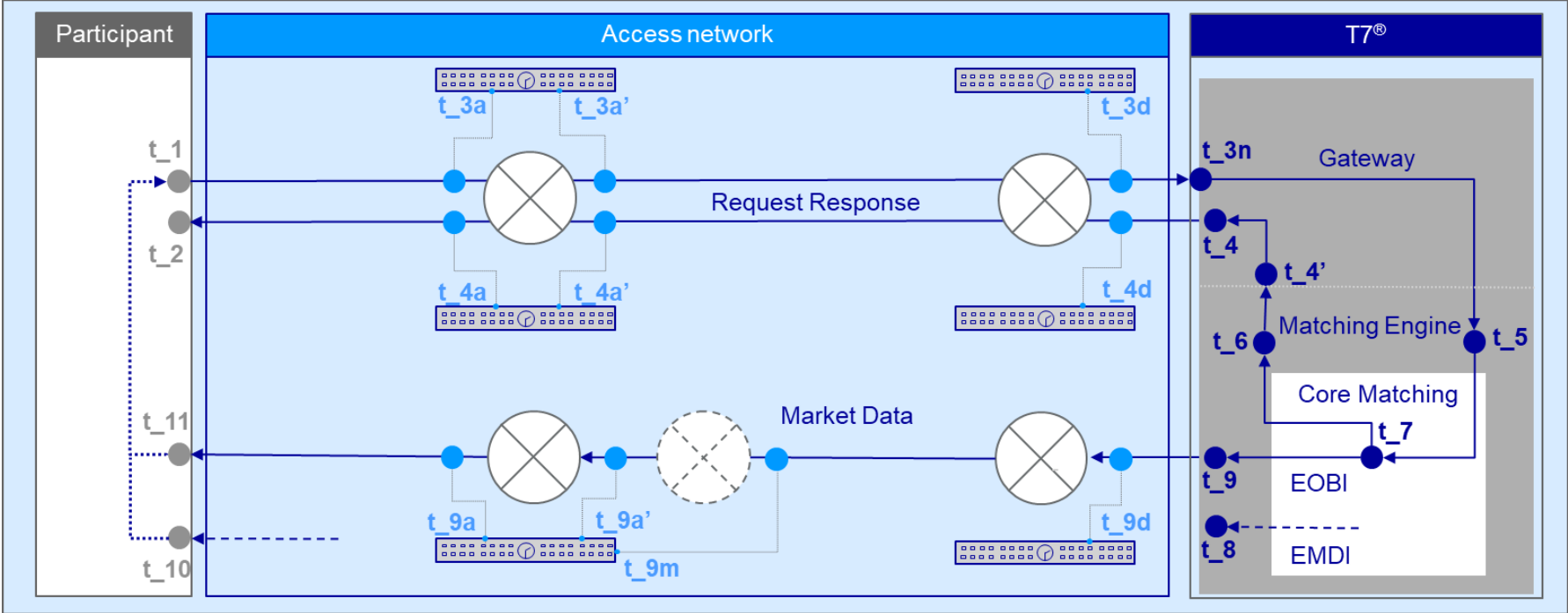
Outlook



- Core to core latency in nanoseconds (ns)
- (lower number/darker blue -> better)
- Higher latency cross chiplets
- Latency doesn't necessarily improve with newer chip generations

Appendix

Timestamp Overview



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OpenDay
2025

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