



T7 Tech Refresh(es)

27/09/2024

Topics

T7 Tech Refresh

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Colocation Tech Refresh

Overview

Improvements

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T7 – History



T7 launched in
2012



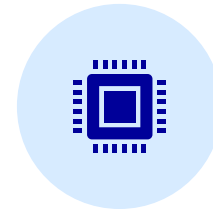
Low latency and
high throughput



Multiple partitions
for load balancing



100 servers



2 x 8 cores CPU



infiniband

T7 – History

T7 Core Network Technology: InfiniBand

What is InfiniBand?

InfiniBand is a very high throughput and very low latency network technology used in high-performance computing

Why do we use InfiniBand in T7?

The T7 internal network was on the critical path and required high throughput and low latency

Why not Ethernet?

Not sufficient throughput and high latency in the 2000's

T7 – History

T7 got
bigger

Additional services

- Enhanced Order by Order Interface (EOBI)
- T7 Entry Services (TES)
- Liquidity Discovery Service (LDS) aka EnLight

Additional markets

- Xetra
- EEX
- Vienna
- Partner Exchanges

Improved and enhanced functionality

- Two releases per year with additional functionality

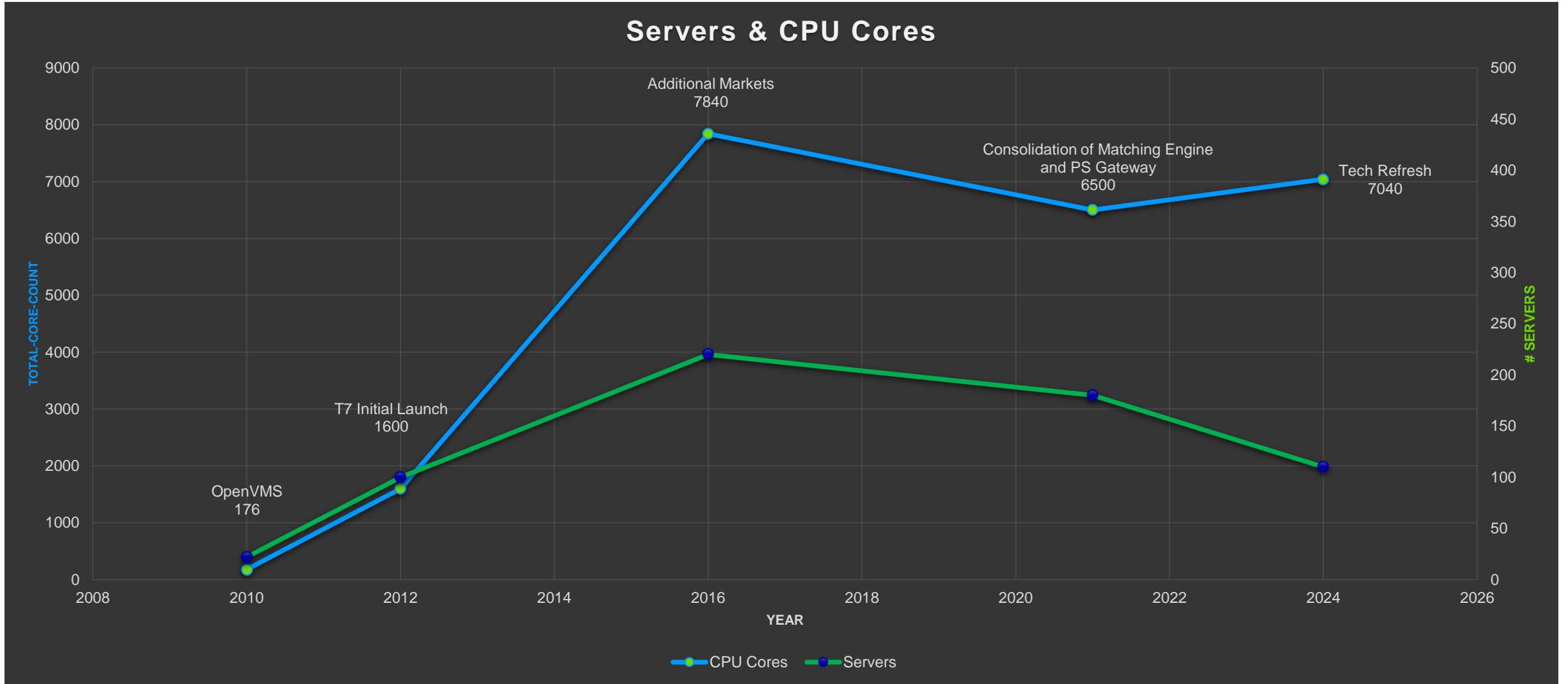
T7 – History

... and

bigger

- **XFRA - a separate environment**
- **Improved Latency**
- **Enhanced Throughput**
- **Tech refreshes every 3 years**
- **Colocation 2.0**
- **Introduction of Partition Specific Gateways**
- **Consolidation of partition processes Matching Engine and GW, EOBI, EMDI**

T7 – Evolution



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* the T7-STD environment is considered only

T7 Tech Refresh

History

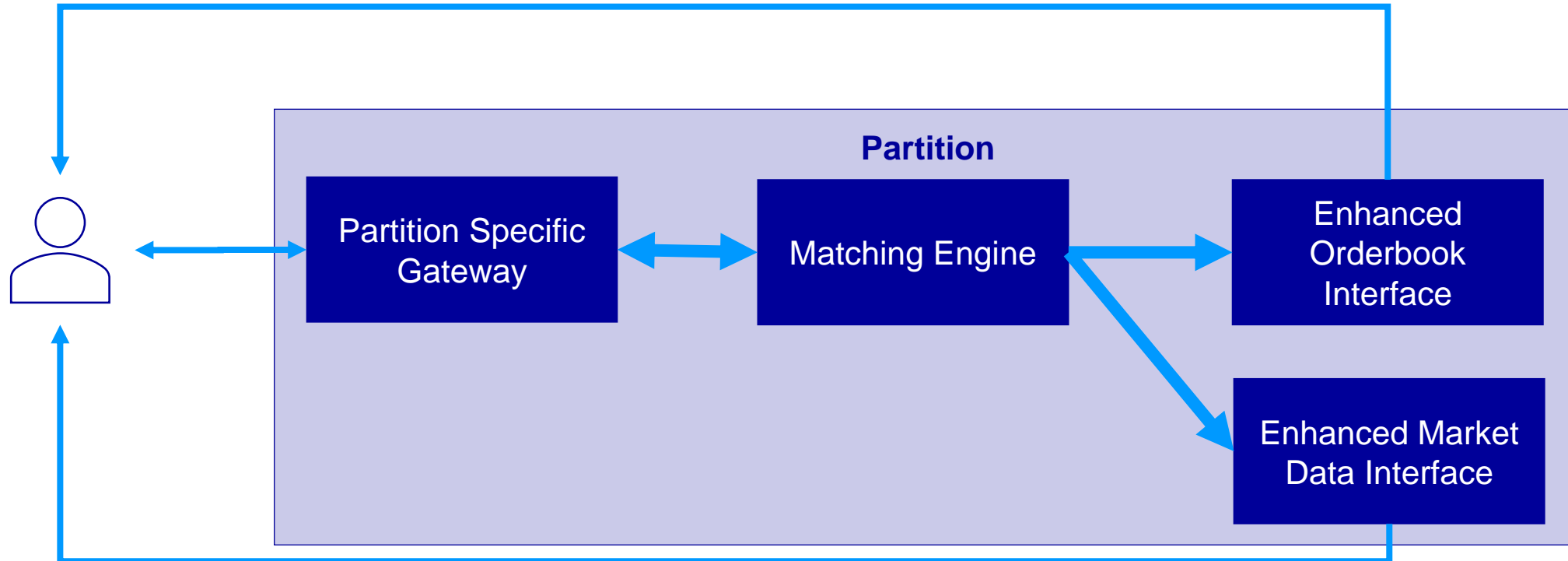
Evolution

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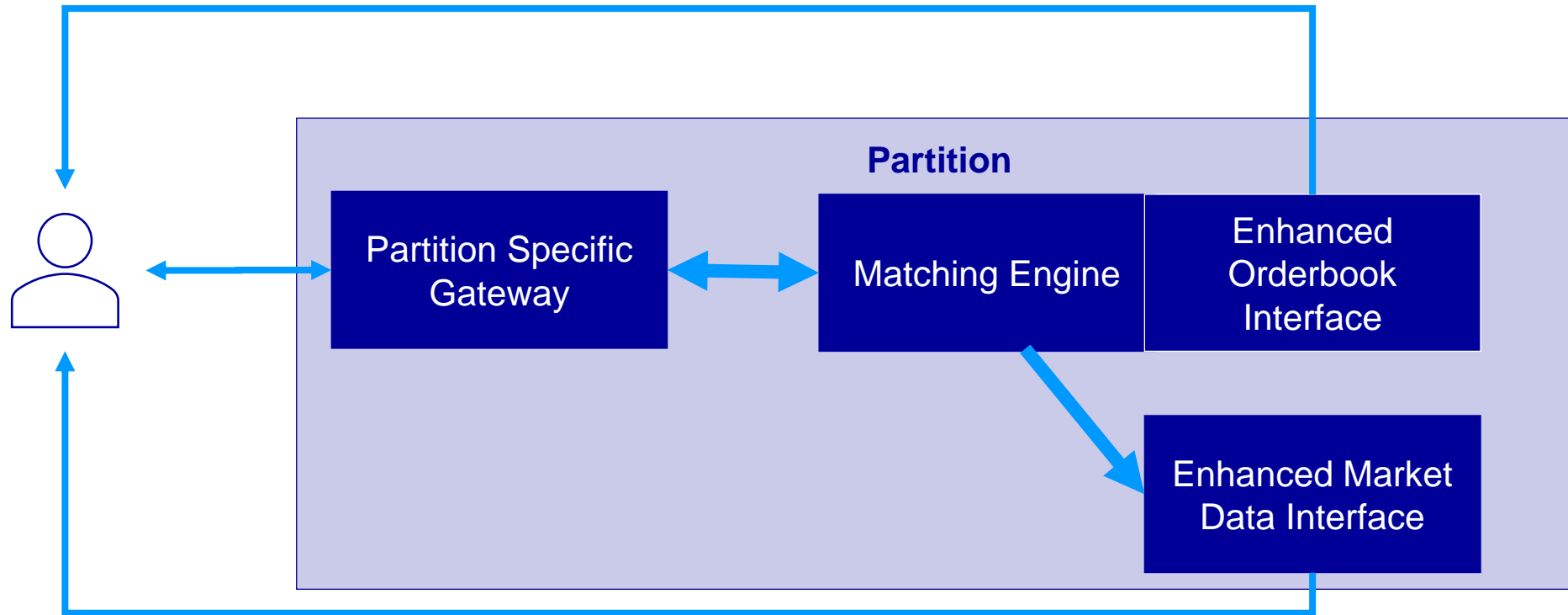
T7 – Evolution



→ T7 core network on the critical path

Server

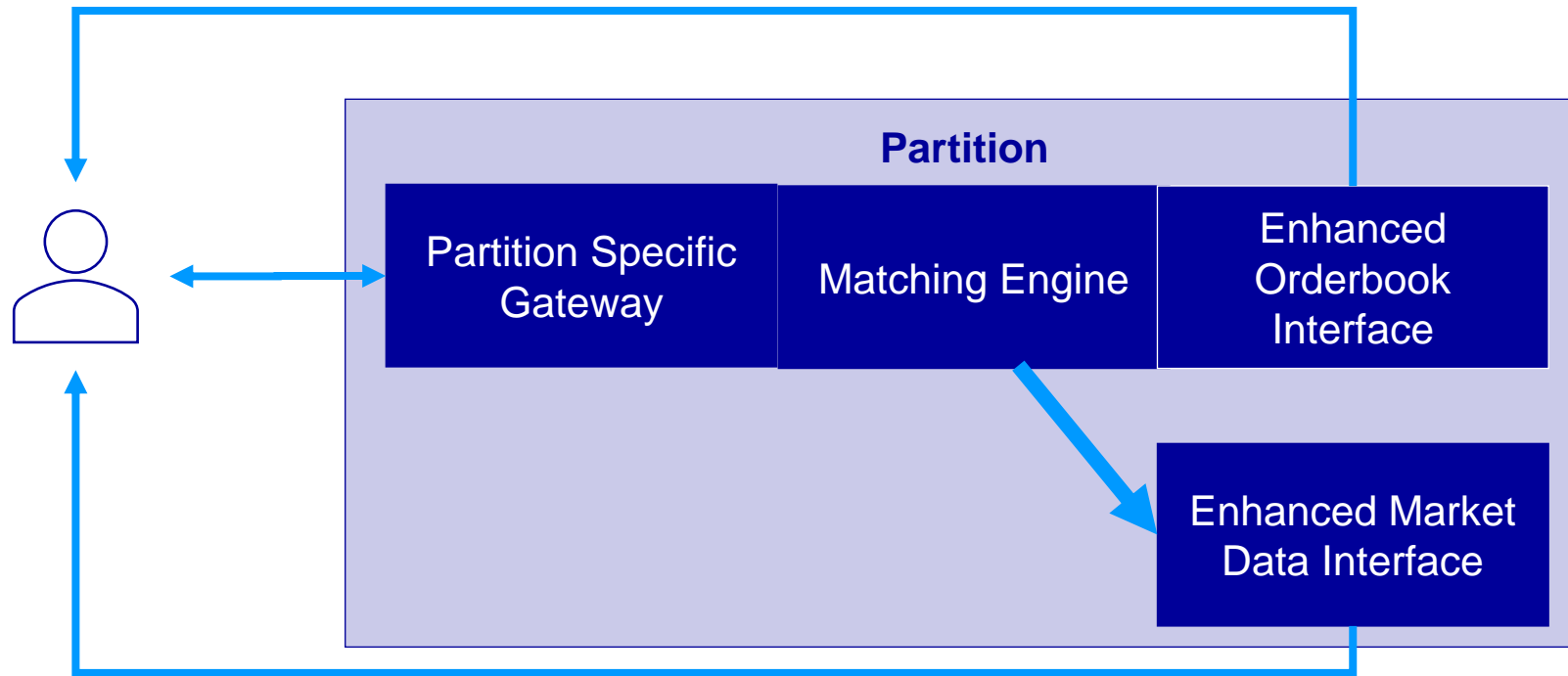
T7 – Evolution



→ T7 core network on the critical path

Server

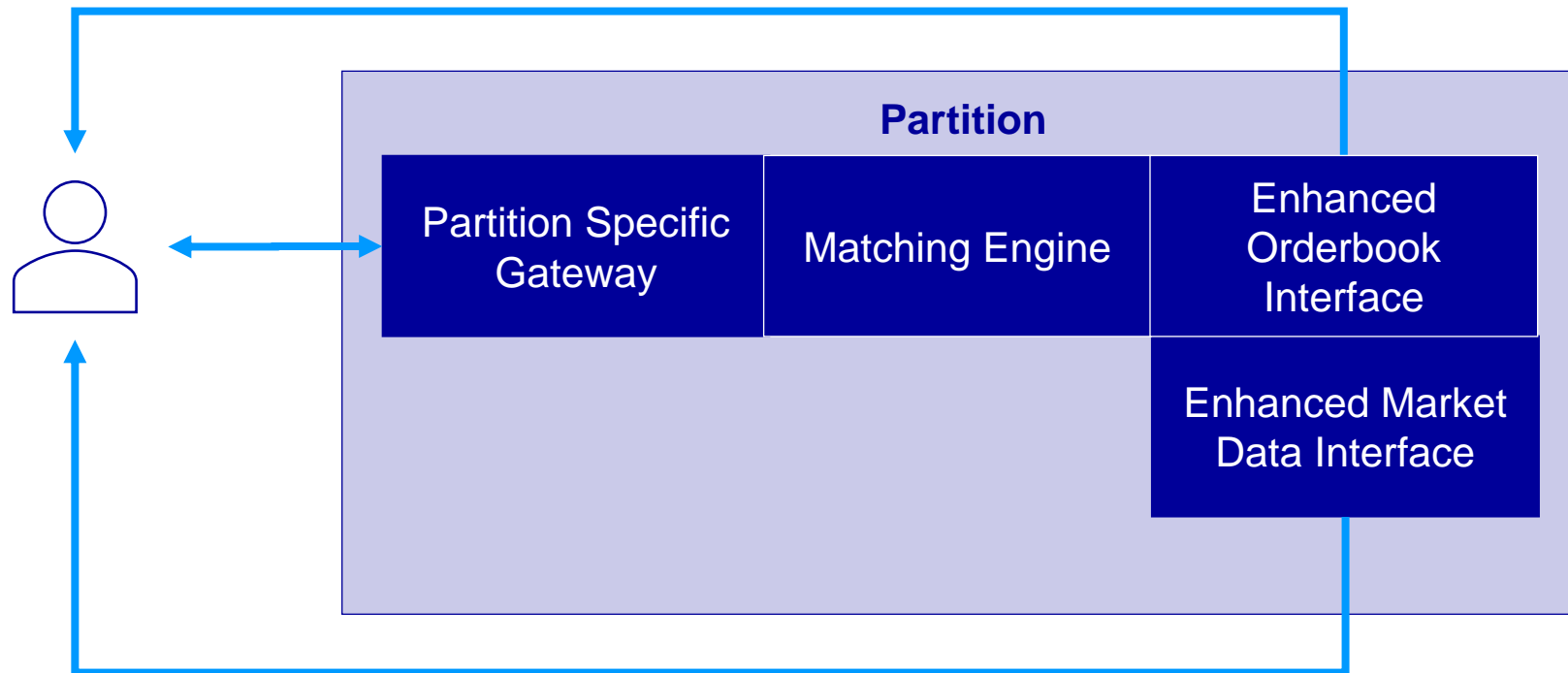
T7 – Evolution



→ T7 core network on the critical path is gone!

Server

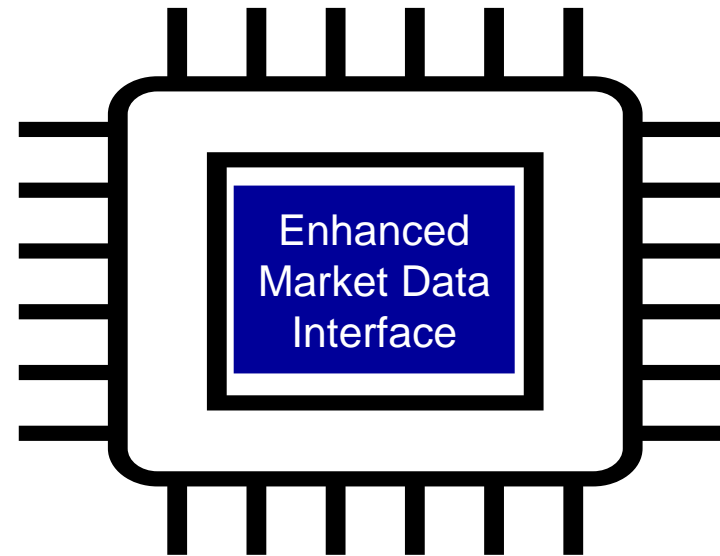
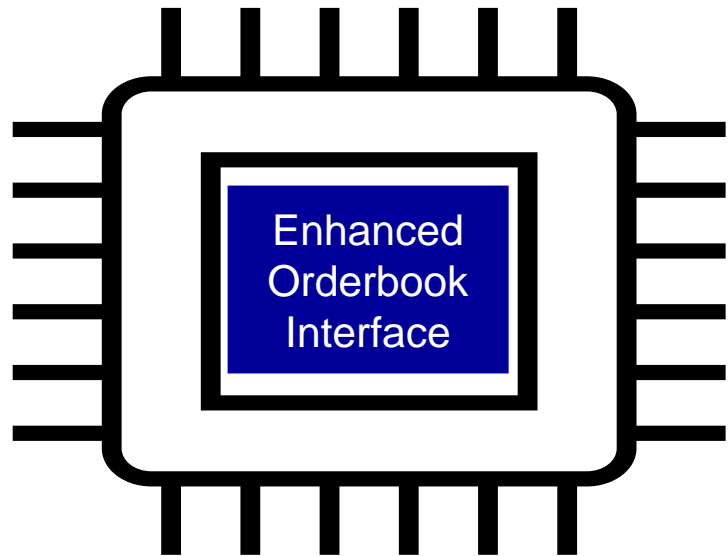
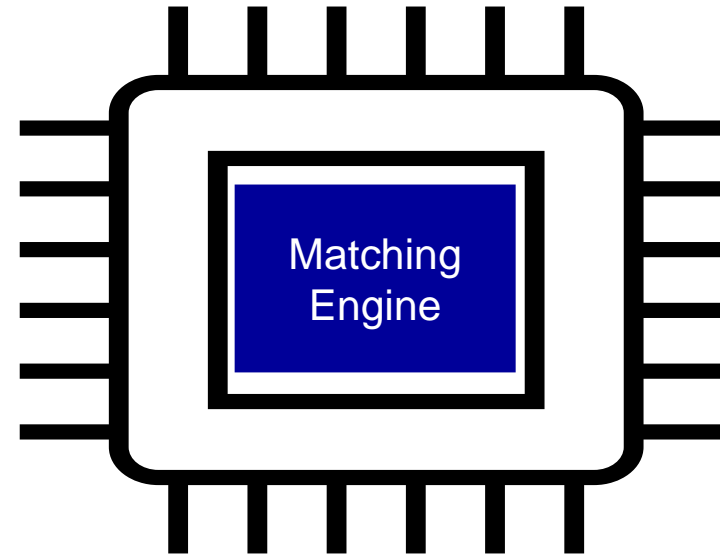
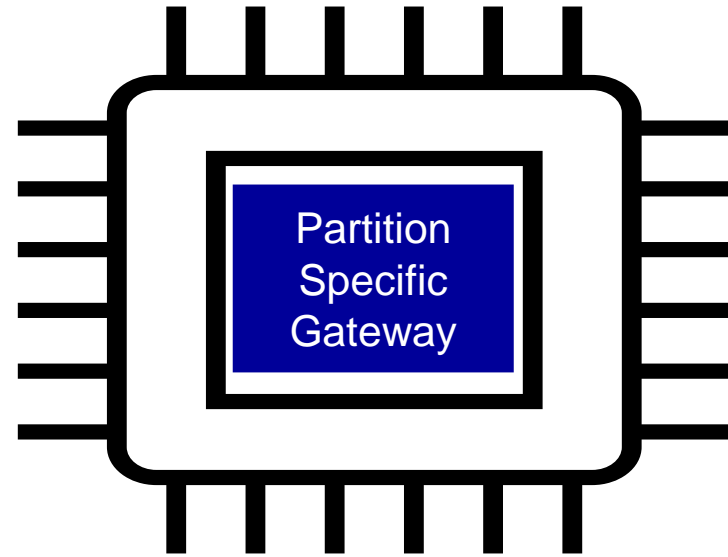
T7 – Evolution



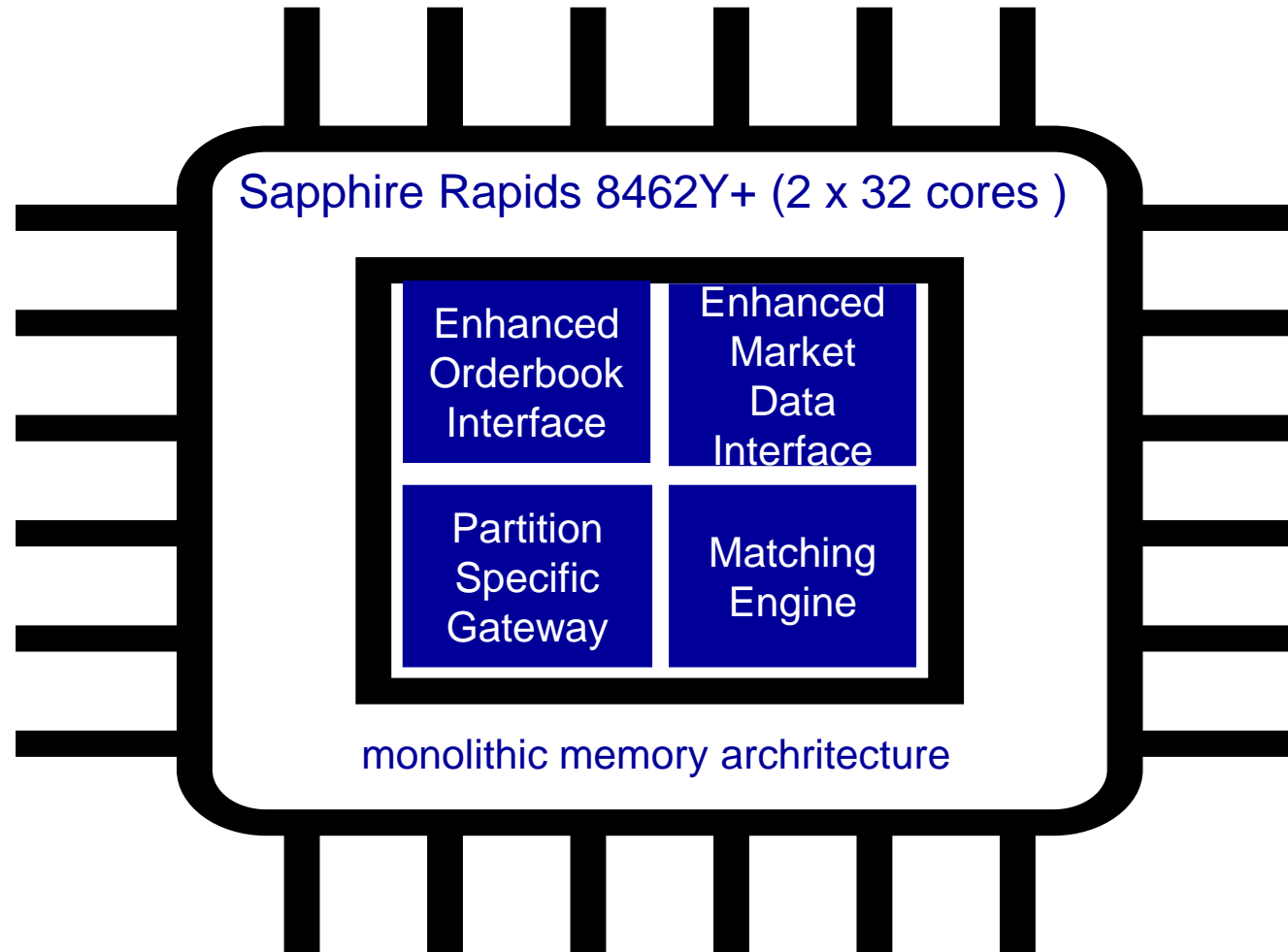
→ T7 core network on the critical path is gone!

Server

T7 – Evolution



T7 – Evolution




T7 – Evolution

Current situation (Q2/2024)

- T7 Core Network: InfiniBand
- 170 servers
- 4 servers per partition
- Matcher host: 2 x 12 cores

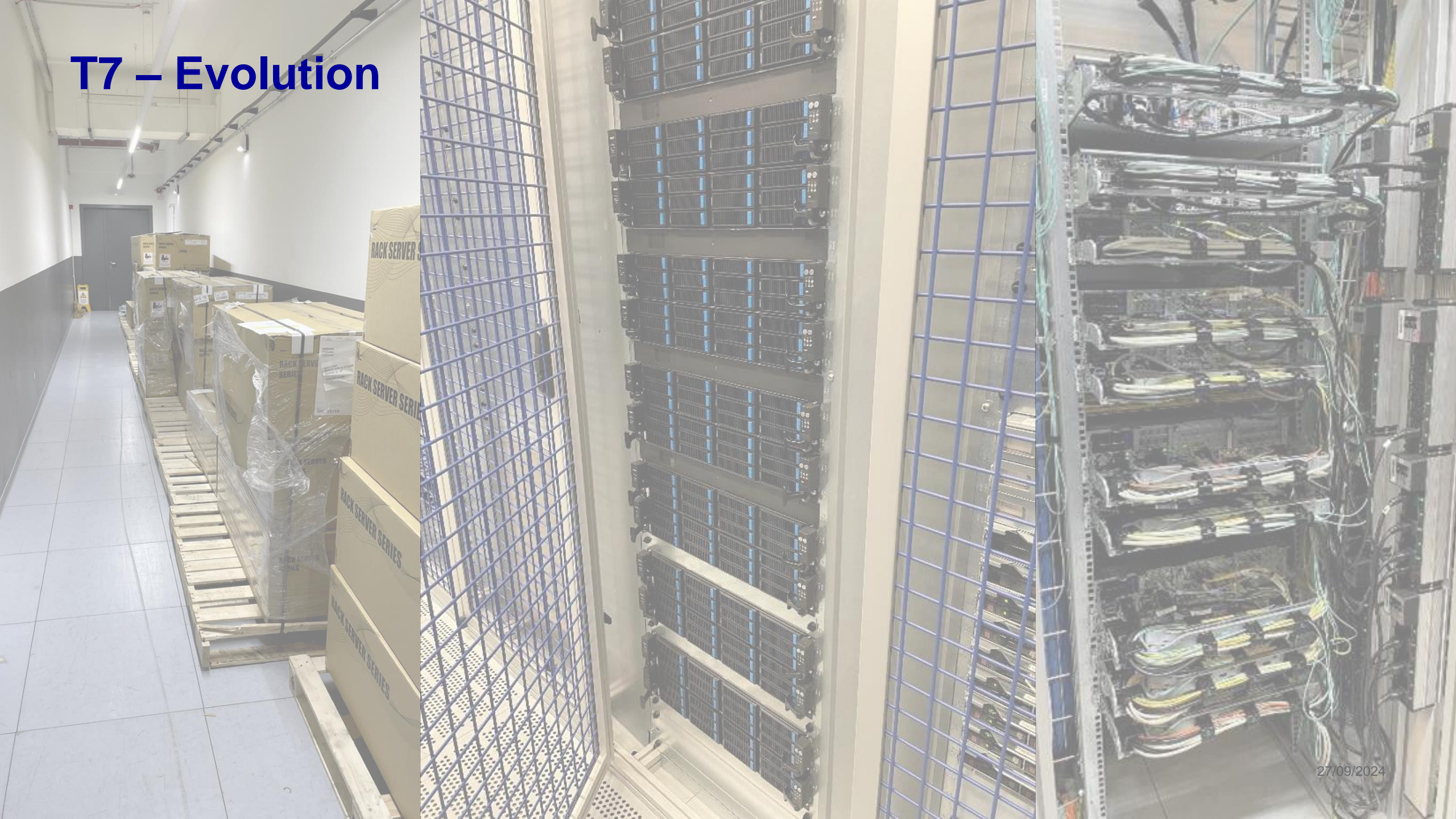
Stepwise
Migration



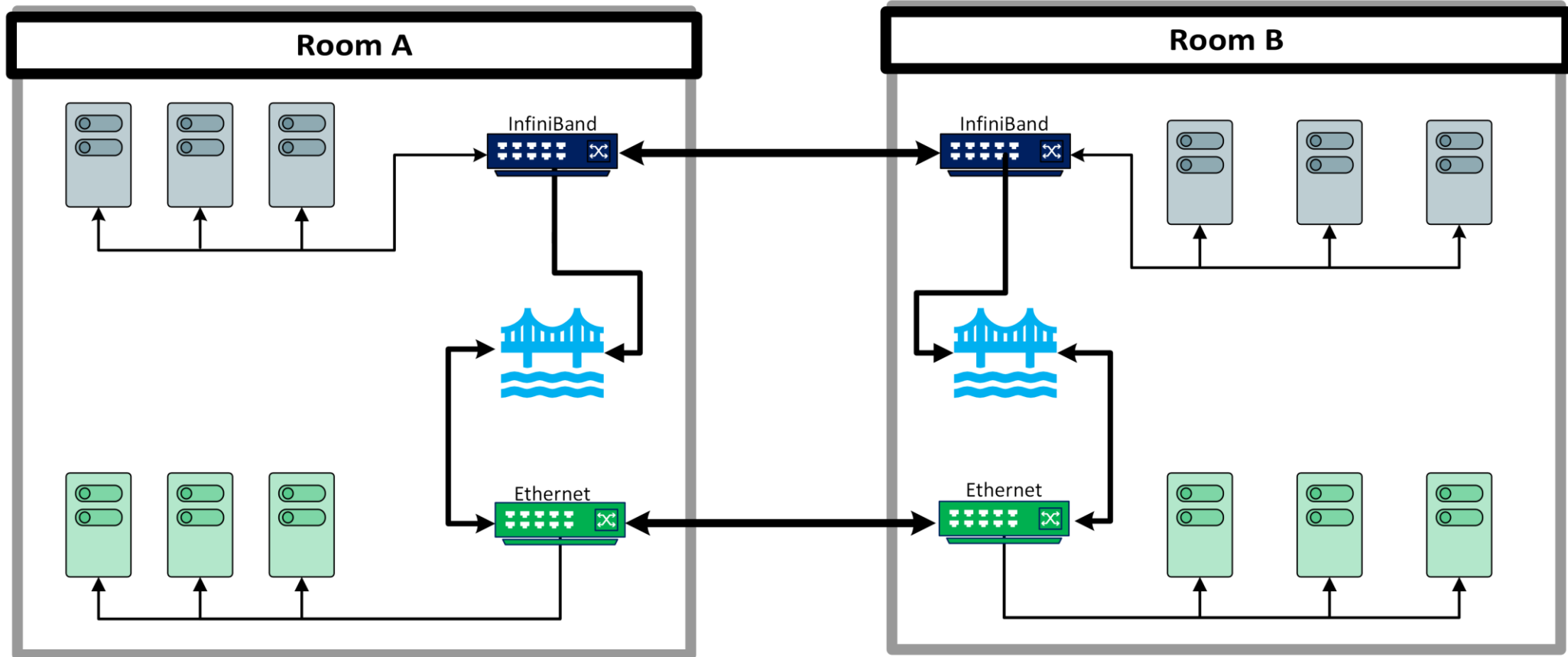
Target design (Q4/2024)

- T7 Core Network: Ethernet
- 110 servers
- 2 servers per partition
- Partition host: 2 x 32 cores

T7 – Evolution

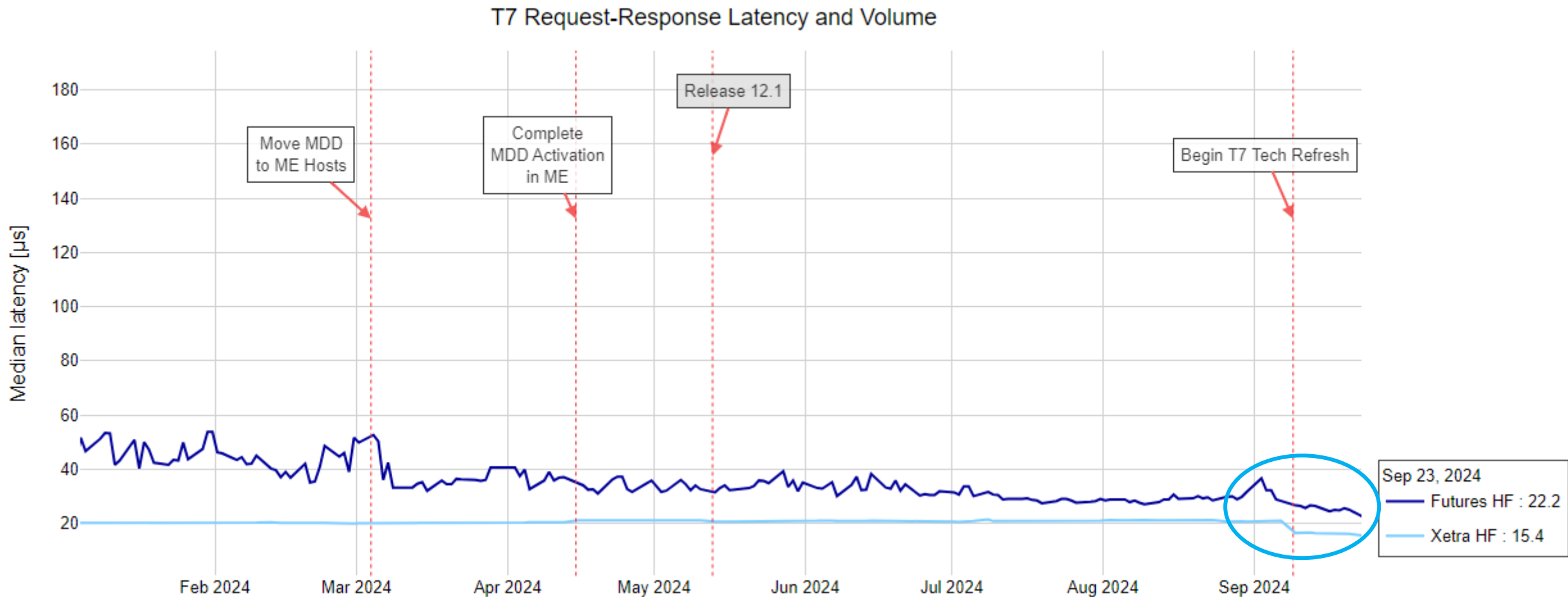


T7 – Migration from InfiniBand to Ethernet

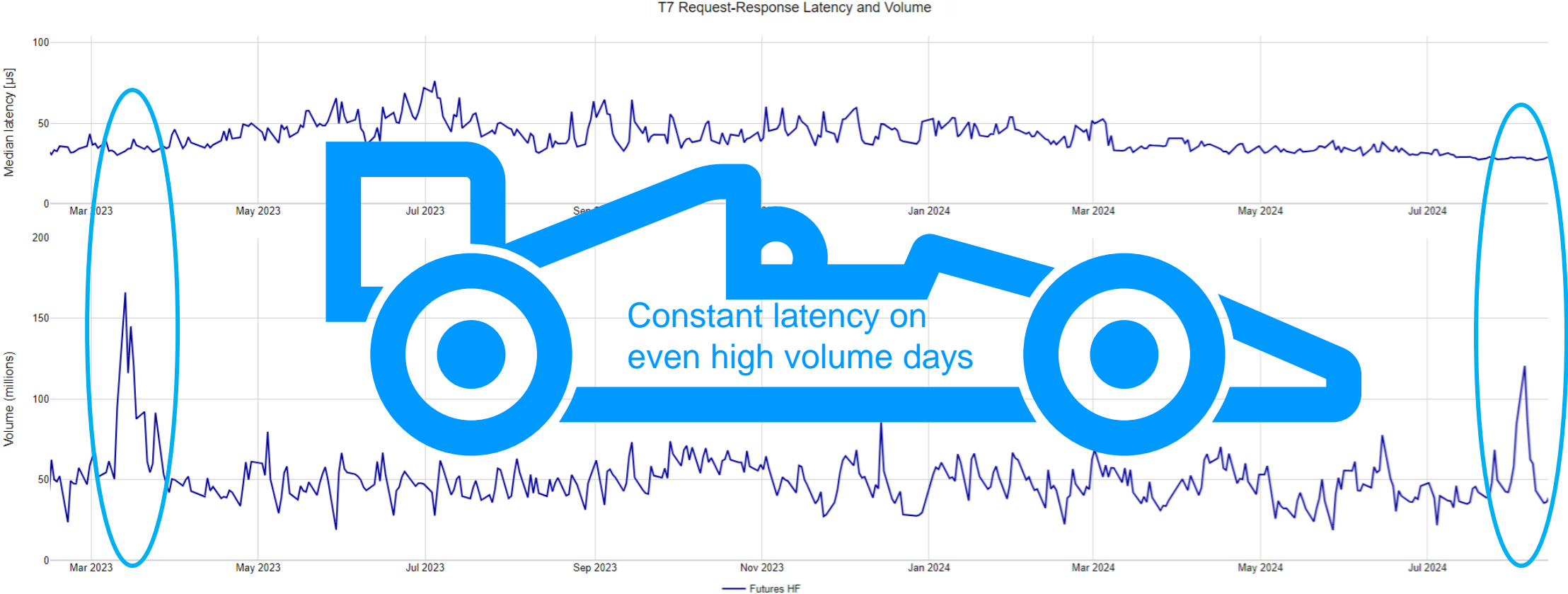


Stepwise migration fom IB to ETH; timeline: July – October 2024

T7 – Motivation



T7 – Motivation



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Colocation – Overview

27 Jan 2017
Eurex

Introduction of the Eurex Co-location 2.0 Service and related changes to Eurex Exchanges' connectivity fees (Price List)

In order to improve the existing high-quality connectivity to their markets, Eurex Deutschland and Eurex Zürich (collectively the Eurex Exchanges) intend to implement two strategic milestones leading towards a state-of-the-art and more predictable technical infrastructure set-up in the course of 2017 and early 2018: **Co-location 2.0** and **First-in-First-out (FiFo) gateways**.

1. First milestone: Introduction of Co-location 2.0

The Co-location 2.0 Service will be implemented to ensure a state-of-the-art and more predictable technical infrastructure setup in the Eurex Exchanges' Co-location facility. The Co-location 2.0 service will be available for market data disseminated via the Eurex Market Data Interface (EMDI) and Eurex Enhanced Order Book Interface (EOBI) market data interfaces and also for transactions submitted via Eurex Enhanced Trading Interface (ETI). From **20 February 2017** onwards, connectivity to the Co-location 2.0 will be available for ordering via the Member Portal. The production start of the Co-location 2.0 service is planned to take place before the start of T7[®] Release 5.0, which is currently scheduled for **19 June 2017**. Changes to the Price List to the Agreement on the technical connection and the utilization of the Trading System of Eurex Deutschland and Eurex Zürich (Connection Agreement) and the Price List to the Agreement on the technical connection to the Electronic Trading EDP Eurex for a Provider of the Multi-Member-System (Provider Connection Agreement) incorporating the new service category will come into effect on **1 June 2017**.

2. Second milestone: Introduction of "First-in-First-out" (FiFo) gateways

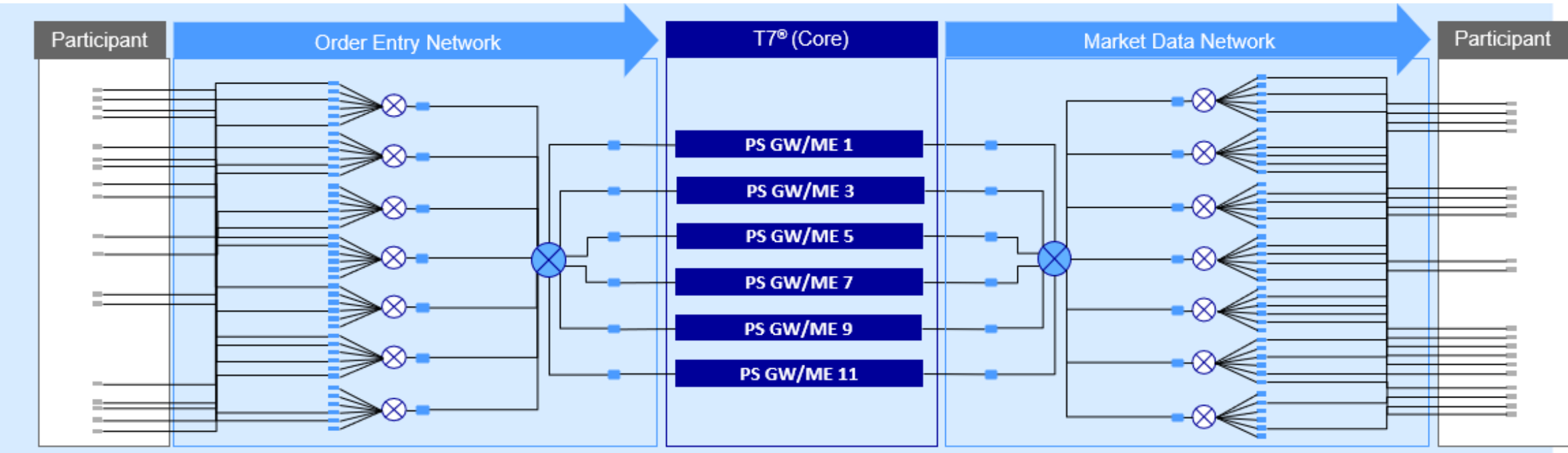
The introduction of partition specific "First-in-First-out" (FiFo) gateways will lead to a more deterministic behaviour and will decrease the number of entry points into the trading system at gateway level. The introduction of the FiFo gateways is planned in a stepwise approach, whereby several measures will already be implemented with T7[®] Release 5.0 and T7[®] Release 6.0 (4 December 2017). The final implementation of the FiFo gateways is scheduled to be completed in **early 2018**.

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Colocation – Overview

Market Model: Price / Time

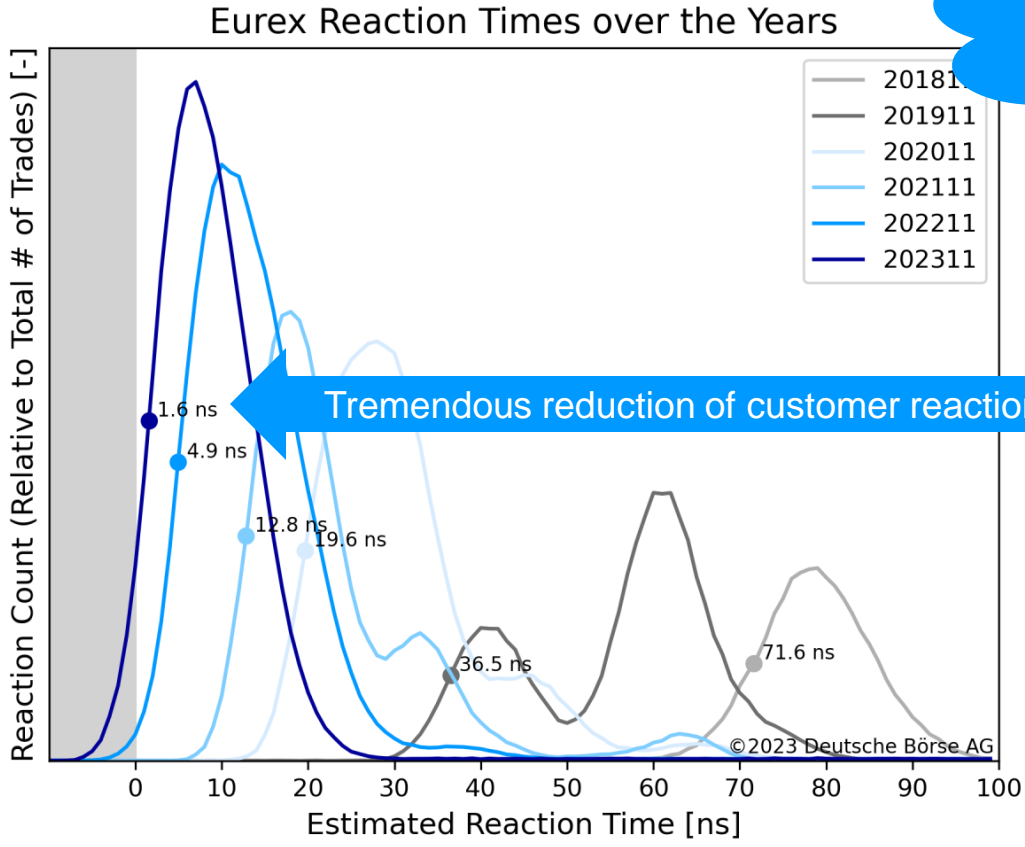
Public Data First



- ⊗ Cisco 3548X Distribution Layer Switch
- ⊗ Cisco 3548X Access Layer Switch
- Optical tap (capture and time measurement)

Colocation – Why Each Centimeter Counts?

1 ns ~ 20 cm ~ 7.8 inches



Tremendous reduction of customer reaction time in last years

2 is the new 5

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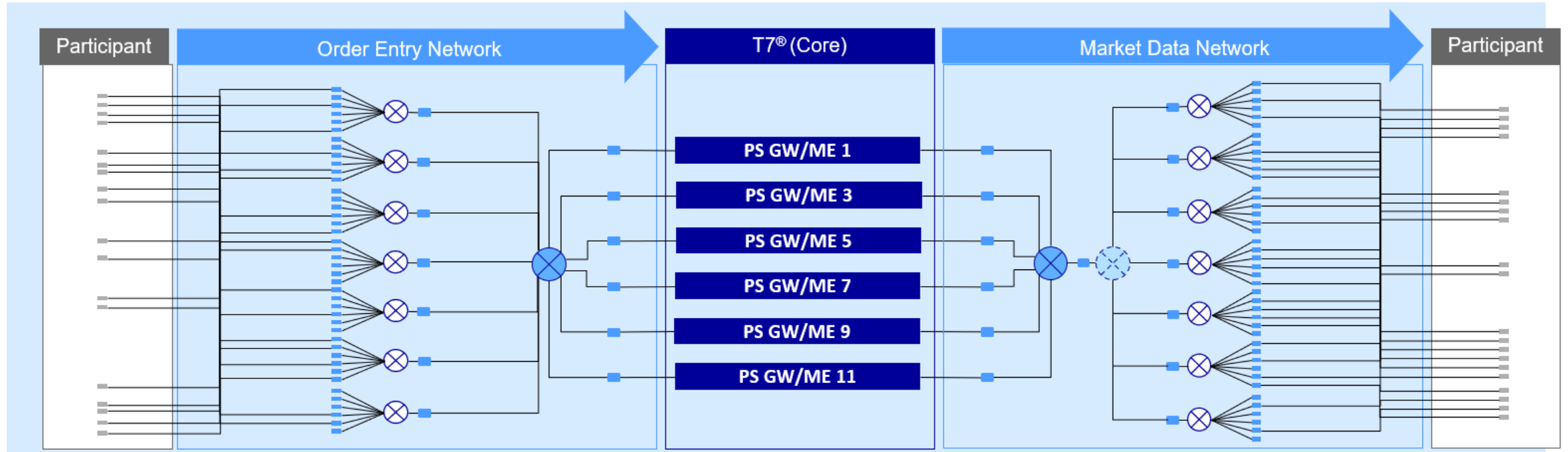
Improvements

Colocation – Tech Refresh & Our Objective

Replace	switches which will reach end of vulnerability/security support in Q1 2025
Reduce	dynamic latency variance in distribution of market data
Reduce	static variance by improved cable normalization between the customers and our switches*
Introduce	Mid-Layer switch (3550T) for Market Data only (see next slide)
Market Data	Replace 3548X by 3550T
Order Entry	Replace 3548X by 3548XL (both switches have similar behavior and latency profile)
Distribution Layer	Replace 3548X by 3548XL

* we will start with the preparation (cassette replacement) in October 2024

Colocation Improvement – Mid-Layer Switch



⊗ Cisco 3548X Distribution Layer Switch

⊗ Cisco 3550T Mid Layer Switch (introduced in Q3 2024 for Eurex)

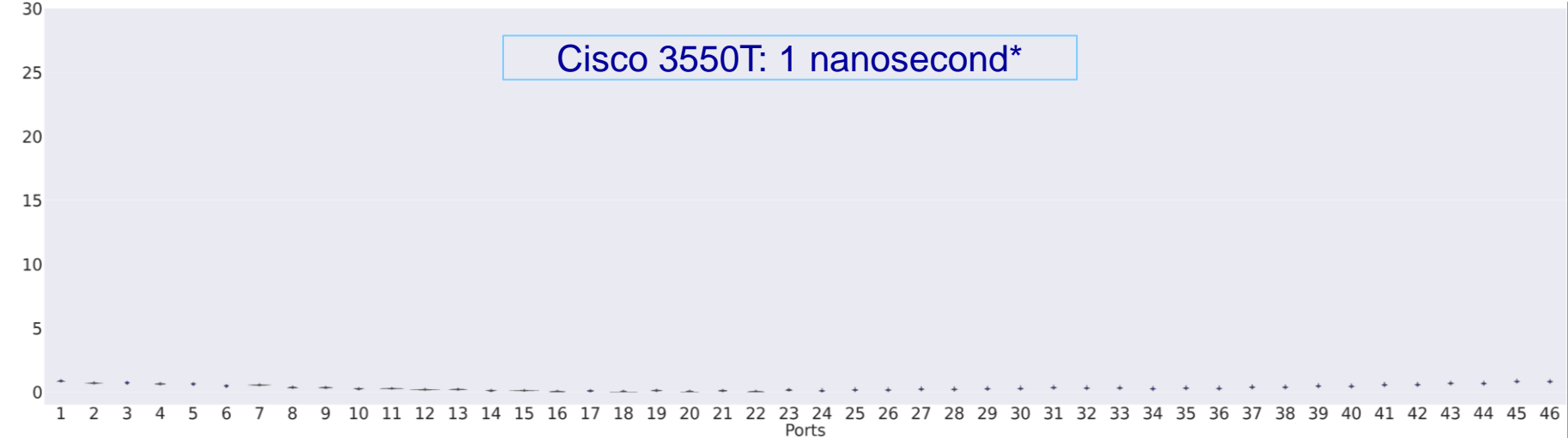
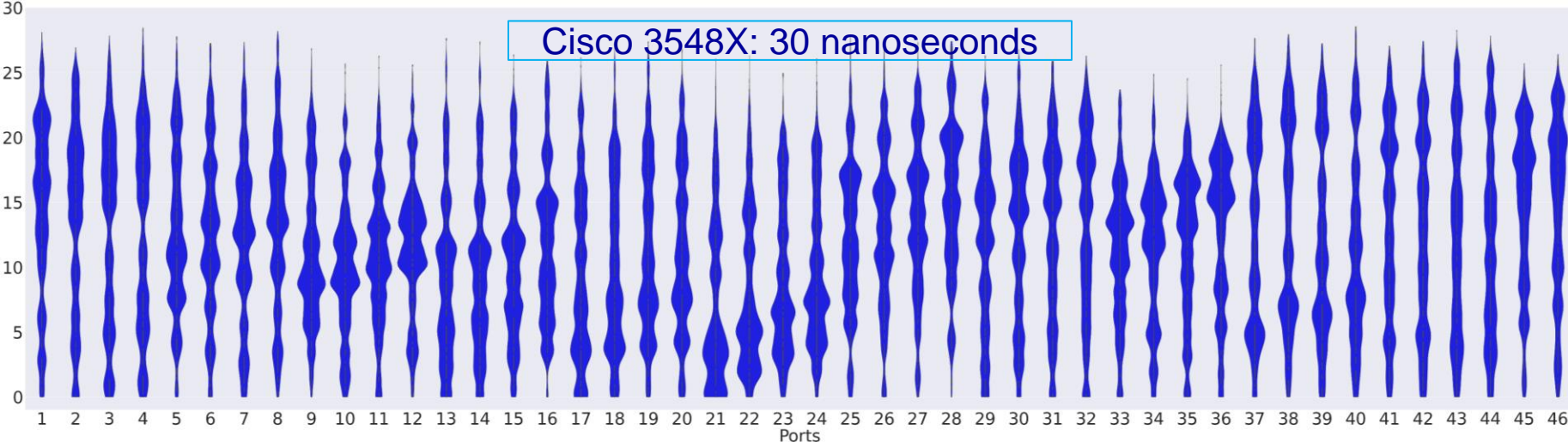
⊗ Cisco 3548X Access Layer Switch

■ Optical tap (capture and time measurement)

- Accurately equalize cable to Access Layer switches due to physical proximity
- Serialize the connection from T7 backend to Access Layer switches
- Achieve more equal distribution of market data to the Access Layer switches

Colocation Improvement – New Market Data Switch

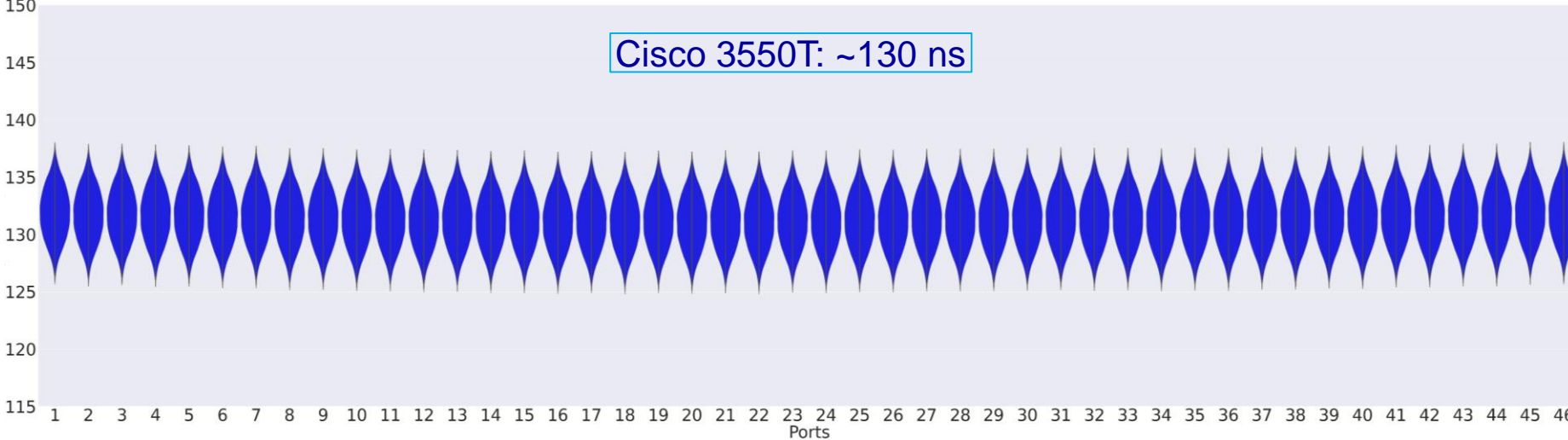
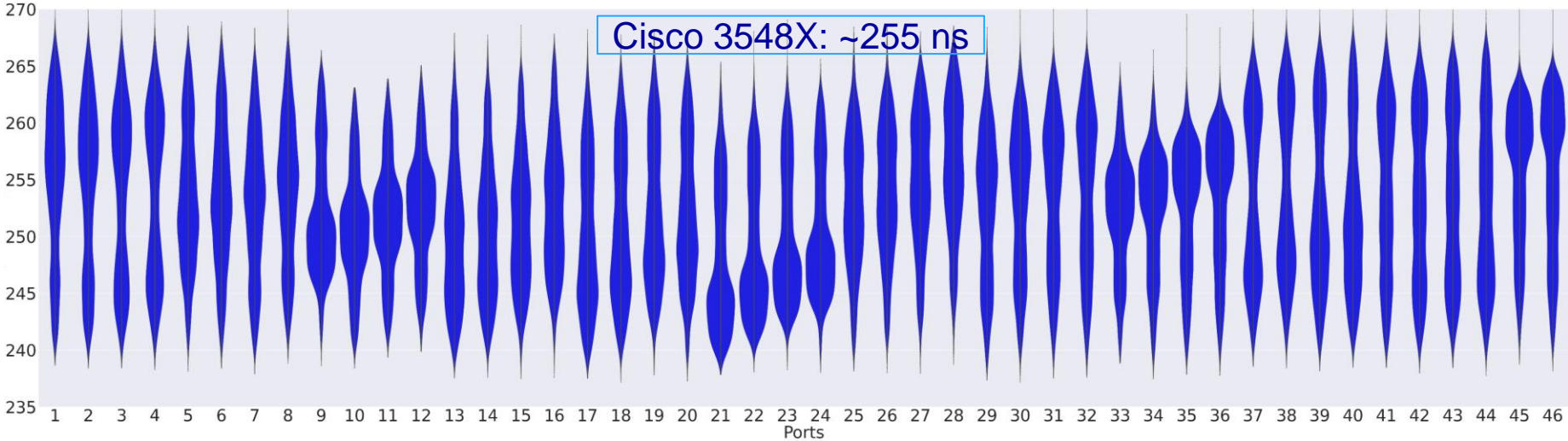
Port to port jitter from the fastest packet



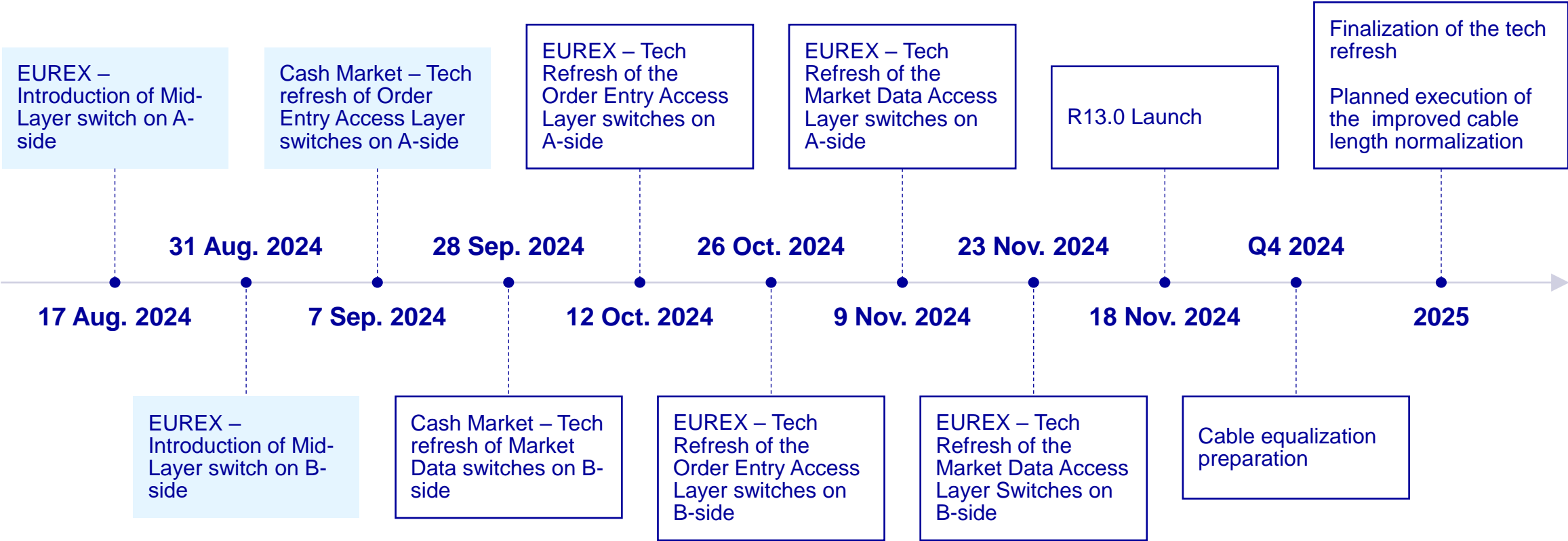
* We expect to receive a firmware update which will reduce the cross-port variance to ~ 100 picoseconds

Colocation Improvement – New Market Data Switch

Switch Latency – Delay from Uplink



Colocation – Next Steps



Summary

Colocation

Target: Reduce dynamic and static jitter

Tech Refresh of the switches (OE: 3548XL; MD: 3550T)

T7

Tech Refresh 2024

InfiniBand → Ethernet

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Thank you!

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