NOVASPARKS

High Performance FPGA Market Data Solutions

Ultra Low Latency Market Data for Everyone

STAC - May 31, 2023

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Our FPGA based solution is Fast and Deterministic

Book Consolidation on Main US Equities Markets

Entire Instrument Universe - 5 Level Aggregation

Full Day from March 5th, 2021

Average: 496ns
P99.9: 600ns

Latency Packet Distribution in %

| | | | 47.9% | 51.46% | 0.53% | 0.1% | 0.0% | 0.0% | 0.00% | 0.00% | 0.00% | 0.000% |
| 0.0% | 0.0% | 0.0% | | | | | | | | | | |

| 200 300 | 300 400 | 400 450 | 450 500 | 500 550 | 550 600 | 600 700 | 700 800 | 800 900 | 900 1000 | 1000 1100 | 1100 1200 | > 1200ns |

Latency bucket in nanoseconds measured from EOP to SOP for 10Gig Ethernet Output

Latency of Feed Handler + Consolidator

Density

SOP-SOP in ns
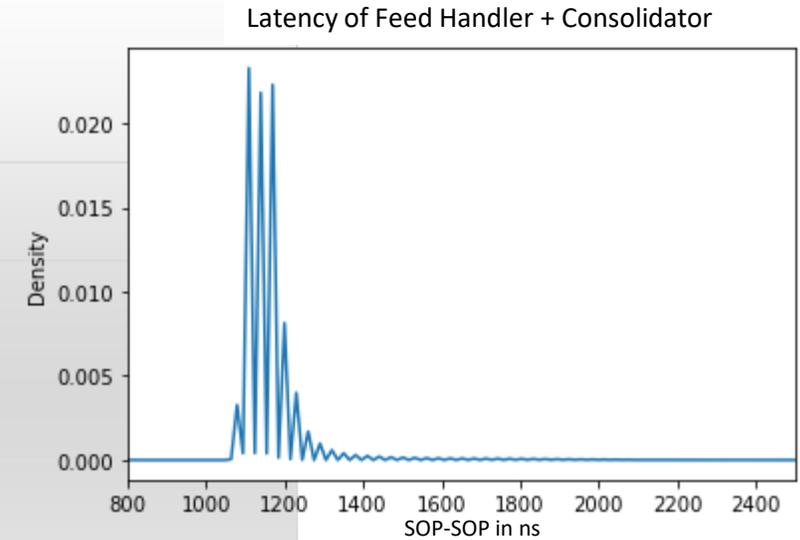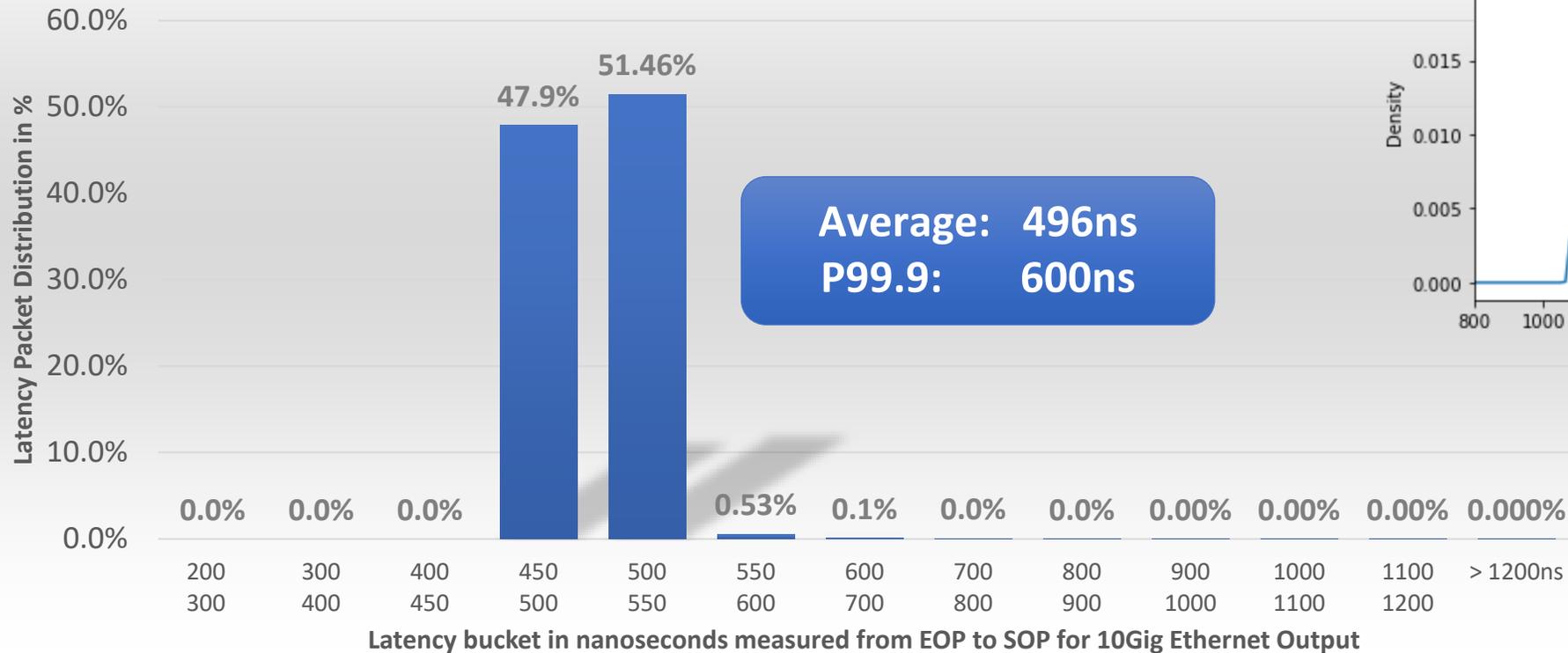
Not a STAC Benchmark

Two Models

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Single box algo

- Direct PCIe Interface
- PCIe Gen3 x16
- Ability to spread across multiple message buffers
- Additional network outputs for Risk, capture or additional use cases.

Enterprise Deployment

- 4 physical output interfaces per market 10/25/40Gb
- 4 cards per appliance
- 32 Configurable multicast per Interface
  - Symbol
  - Exchange
 - Message Type
- Entire US Equity deployment on a box

NOV∧TICK Offers Three Ways to Distribute Market Data

Software Trading Through PCIe DMA

900ns

Software Trading Through 10Gig Multicast
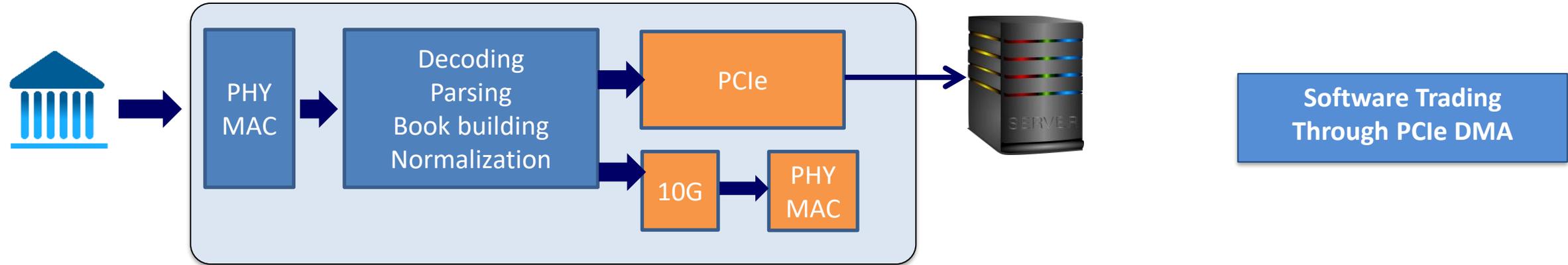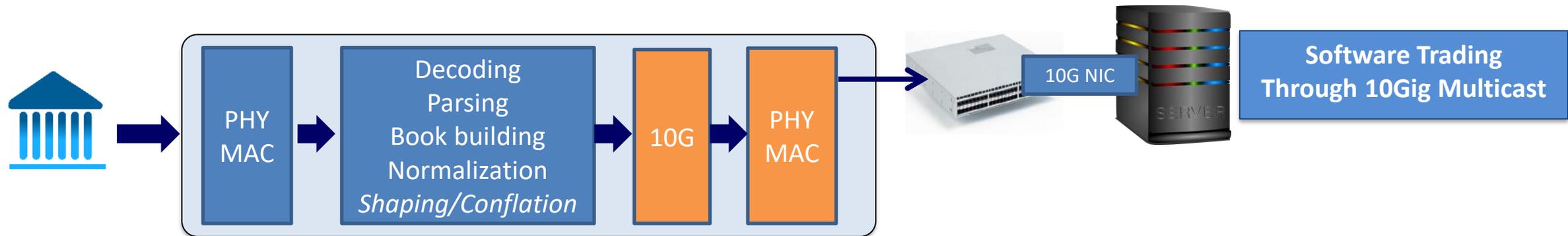
1100ns-1400ns

Not a STAC Benchmark

End to End Latency Nasdaq PCIe into Software Application

Mean Latency: 902ns
P99: 1500ns
Standard Deviation: 167ns

Not a STAC Benchmark
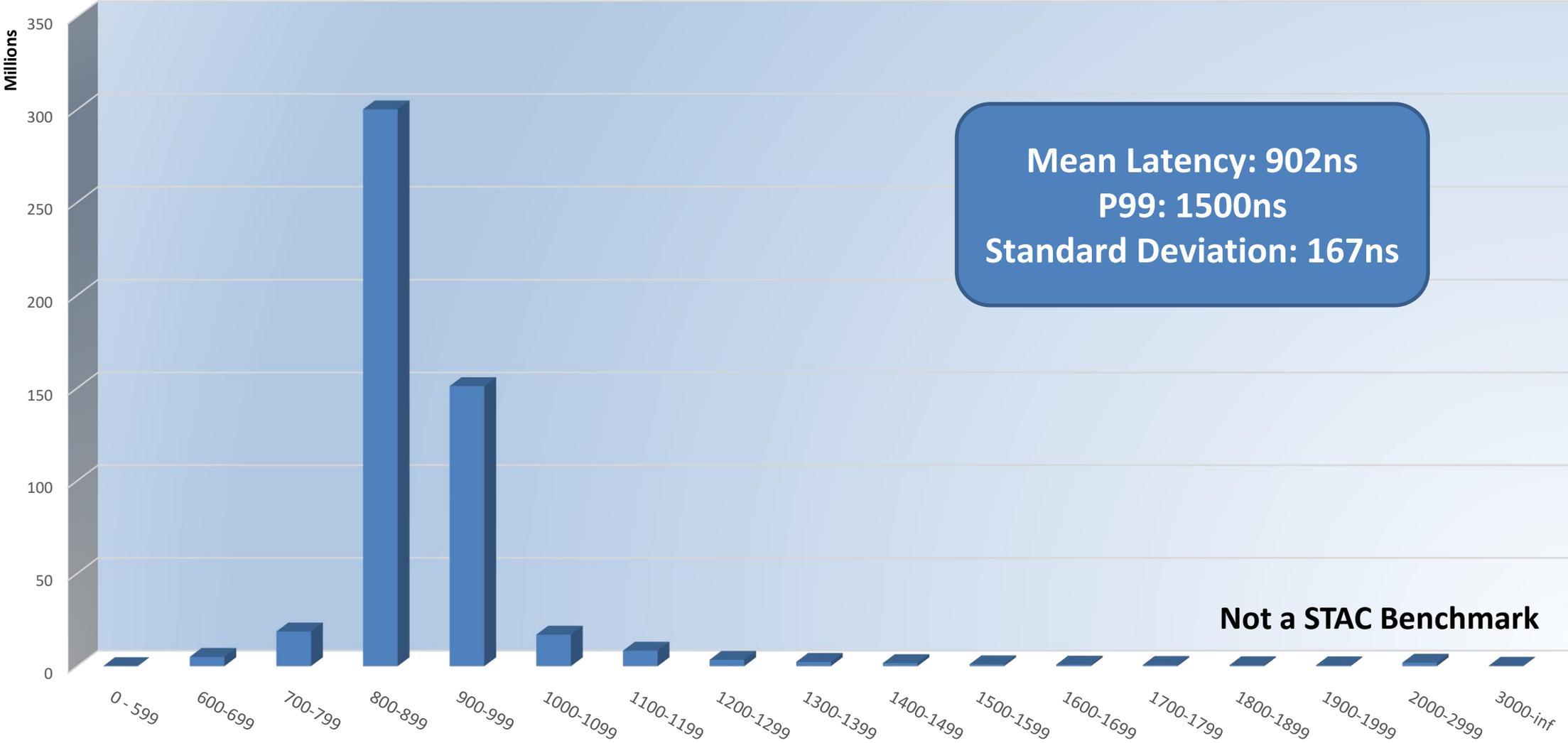
Full Function Enterprise Scale Market Data Platform

- Full Exchange Recover A/B Arb + Retransmission support – heavily used in NJ Triangle

- Client-Side Recover – Refresh loop

- Queryable Symbol Master

- NovaSparks Wire Format (NSWF) available to customers

- C++ Decoding and L2 API
  - Filtering
  - Kernal bypass support
  - Hides changes to underlying format changes
  - High Bandwidth low latency

- Enterprise Monitoring Support

- DACS Integration for entitlements

Pure FPGA Market Data Solutions

Check the NovaSparks box on your card
or email sales@novasparks.com