



METAMAKO

5 years of Innovation in 5 minutes

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Chief Technology Officer
June 2018

Simplifying networks
Reducing latency in Electronic Trading
Opening up network packet visibility
Increasing flexibility



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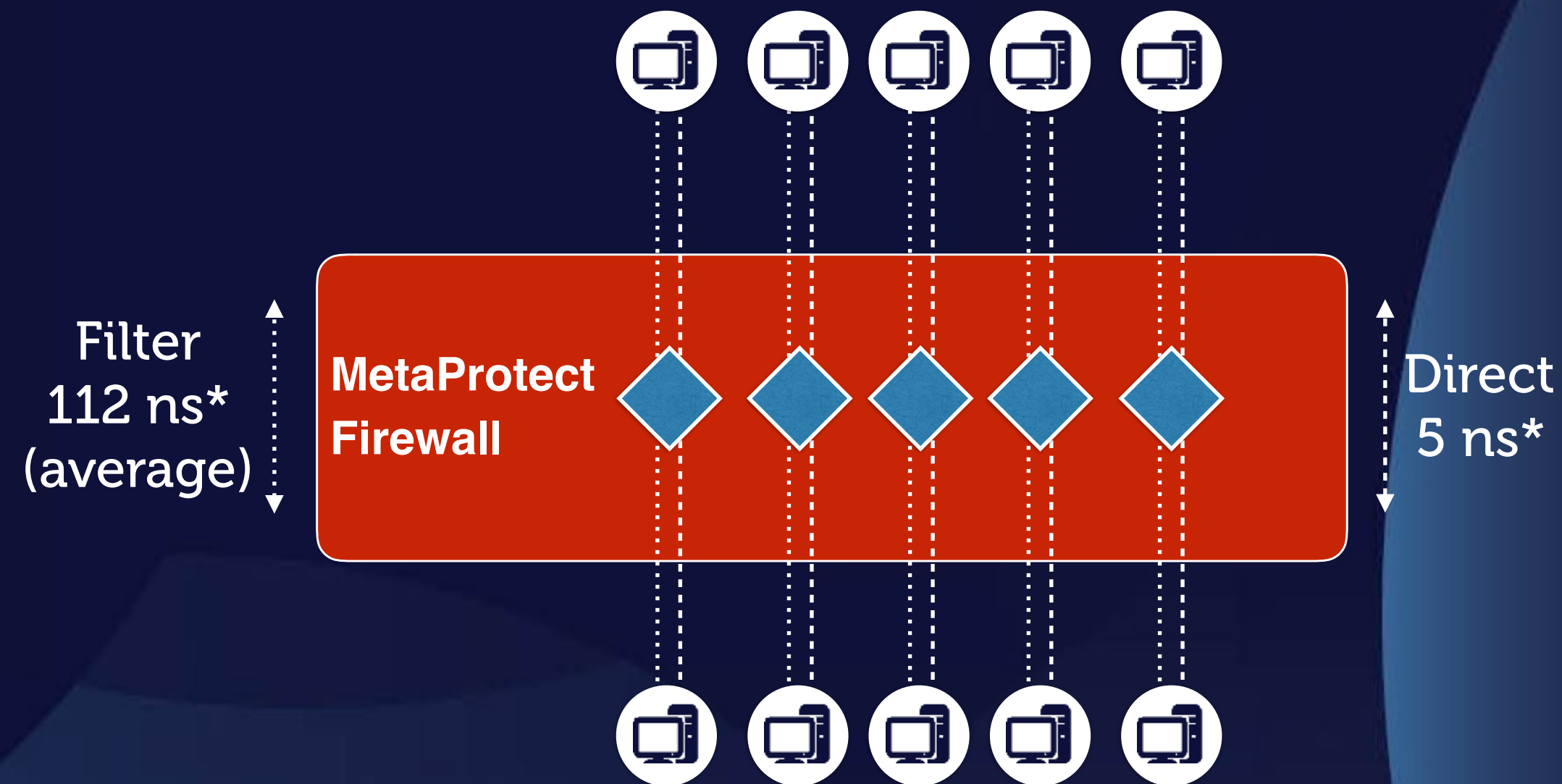
Announcing the MetaProtect™ Firewall





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MetaProtect™ Firewall



Advantages:

- secured appliance
- 48 10GbE SFP+ ports
- 32 filters implemented via ACLs:
 - may be applied to any port leveraging integrated L1 switch
 - support for L3/L4 filter expressions
- full MOS features including:
 - comprehensive port statistics
 - telemetry
- 112 ns* of latency via filters
- 5 ns* of latency via L1 switch
- meets KRX and other execution venue requirements

*Not STAC-verified results — average of the minimum latency mode

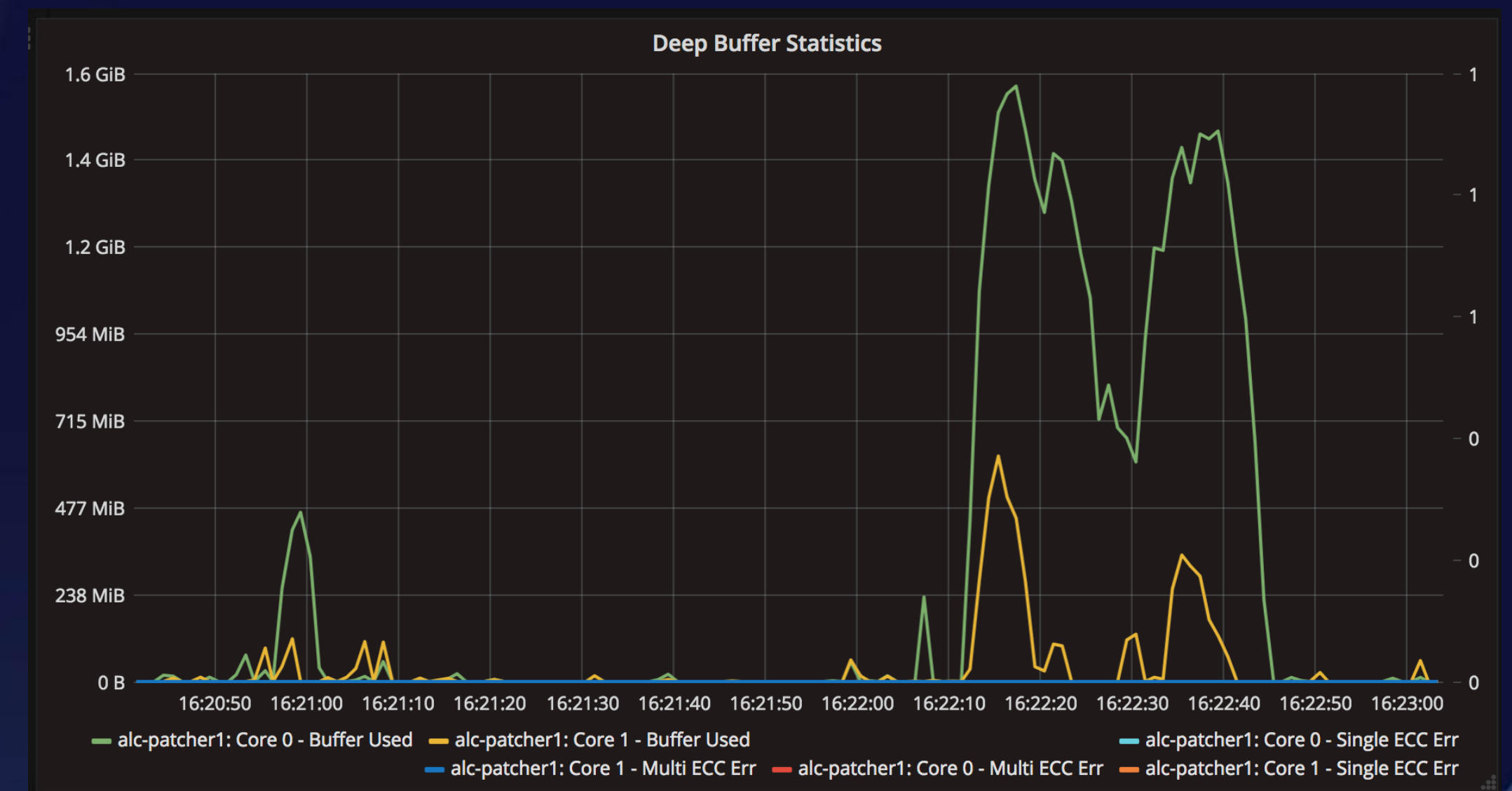


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MetaWatch 0.8

Enhancements:

- Output to a Kafka broker for shared output — we use this, and it's great.
- calibrated port offsets from front panel to FPGA - removes timestamp skew across ports to sub-nanosecond
- PPS Out:
 - daisy chain devices with the first connected to an external time reference
 - sync multiple devices to a reference device
- output port rate controls leveraging multi-GB buffer:
 - 802.3x PAUSE frames
 - define maximum packet rate
 - define maximum bandwidth



- MetaWatch in use by the Australian Stock Exchange and Deutsche Börse Group
 - Deutsche Börse Group monitors every trade with Metamako: <http://blog.metamako.com/deutsche-börse>



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Metamako buys xCelor's hardware business



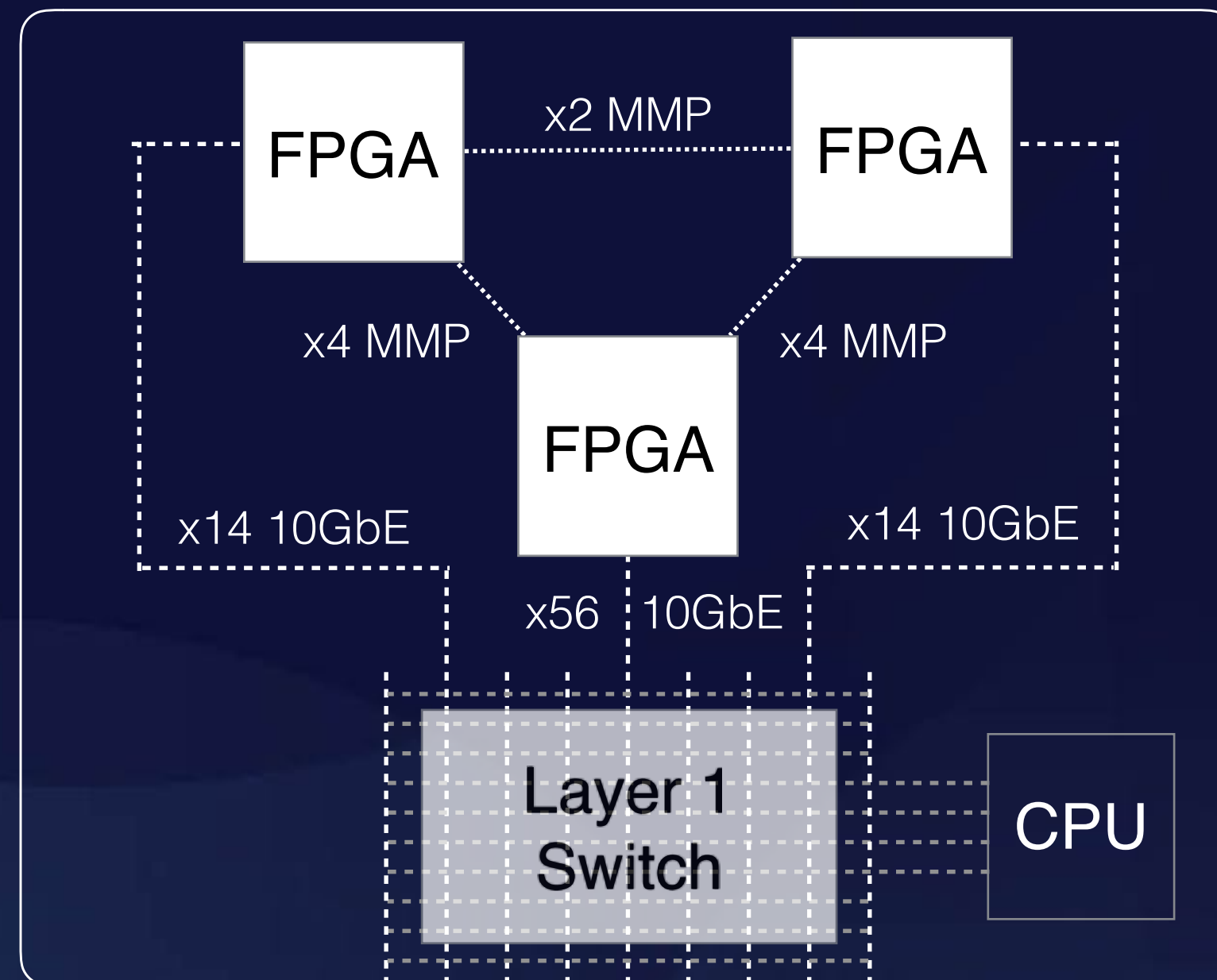
The deal:

- Metamako's first strategic acquisition; buying the xCelor device business
- xCelor will now focus on its applications business, providing its apps on the Metamako platforms - future partnership
- Metamako as 'platform of choice' for running applications
- great news for clients given rich and evolving Metamako platform features:
 - command and control: GUI, CLI, JSON-RPC
 - Metamako operating system (MOS)
 - monitoring: comprehensive traffic counters, telemetry
- new Chicago office



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Triple-VU9P-3 devices now in stock



1 or 2 RU Chassis

Architecture:

- central FPGA connected to each leaf FPGA with 2 MMP Busses
- leaf FPGAs connected to each other with 1 MMP Bus
- Xilinx UltraScale/UltraScale+
- connected to the Layer 1 Switch with up to 76 x 1/10GbE ports
- FPGA Development Kit available

Advantages:

- <10 ns nanoseconds* of latency between MMP-connected FPGAs
- IP Core with AXI4-stream interface coming soon

*Not STAC-verified results



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Automated latency measurement in regression

Enhancements:

- all Metamako software/gateway products now have their latency (or timestamp accuracy) measured every time they are built
- we leverage MetaWatch's nanosecond timestamping to measure product/device latencies as part of our regression testing
- this allows us to ensure that we know the measured performance of every single version of our products rather than periodically benchmarking them
- the performance we quote in every release is the performance that clients will see

Appendix

6.1 Latency measurements

6.1.1 C-series

M48-A4A - 16x4

Table 6.1: latencies_M48-A4A_16x4

port	average	median	variance	minimum	maximum	num-samples	mux-id
ap1	70.37	69	7.0848	67	77	10000	mux1
ap2	70.81	72	6.8916	64	74	10000	mux1
ap3	69.37	69	0.8190	67	72	10000	mux1
ap4	69.88	70	0.7292	67	72	10000	mux1
ap5	70.52	71	2.1848	64	73	10000	mux2
ap6	70.84	72	9.3281	65	75	10000	mux2
ap7	69.13	68	7.5699	65	75	10000	mux2
ap8	70.74	69	9.3043	66	77	10000	mux2
ap9	70.08	69	5.7064	67	76	10000	mux3
ap10	71.27	71	0.9944	69	78	10000	mux3
ap11	70.10	70	1.0850	64	73	10000	mux3
ap12	70.47	72	7.9826	65	75	10000	mux3
ap17	69.91	68	9.0257	65	76	10000	mux4
ap18	70.01	70	0.8639	64	72	10000	mux4
ap19	72.01	72	0.5824	70	74	10000	mux4
ap20	70.31	70	3.8213	68	77	10000	mux4
ap21	70.38	72	7.6249	64	75	10000	mux5
ap22	69.19	69	5.9971	66	77	10000	mux5
ap23	70.18	72	7.8447	66	75	10000	mux5
ap24	70.87	72	9.9046	65	75	10000	mux5
ap25	70.56	71	3.9934	64	73	10000	mux6
ap26	71.15	72	6.4165	66	75	10000	mux6
ap27	69.39	68	6.1887	66	75	10000	mux6
ap28	70.84	71	1.7651	65	73	10000	mux6
ap29	68.94	69	3.2279	66	77	10000	mux7
ap30	69.11	69	0.7471	66	72	10000	mux7
ap31	70.30	71	6.2587	63	73	10000	mux7
ap32	70.03	72	10.3066	63	75	10000	mux7

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A few more things...



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MetaWatch Resolution

Nanoseconds



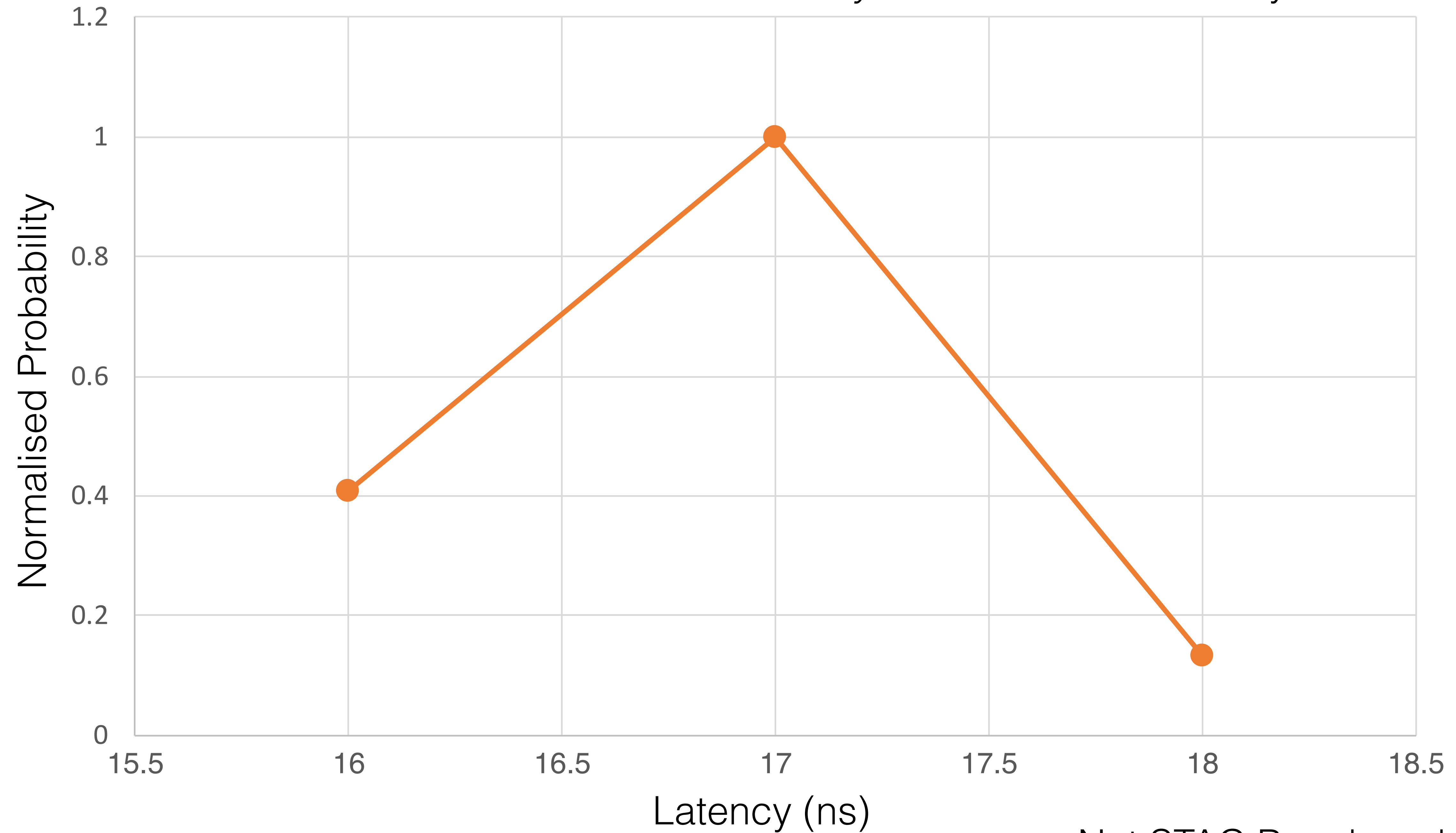
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MetaWatch Resolution

Attoseconds

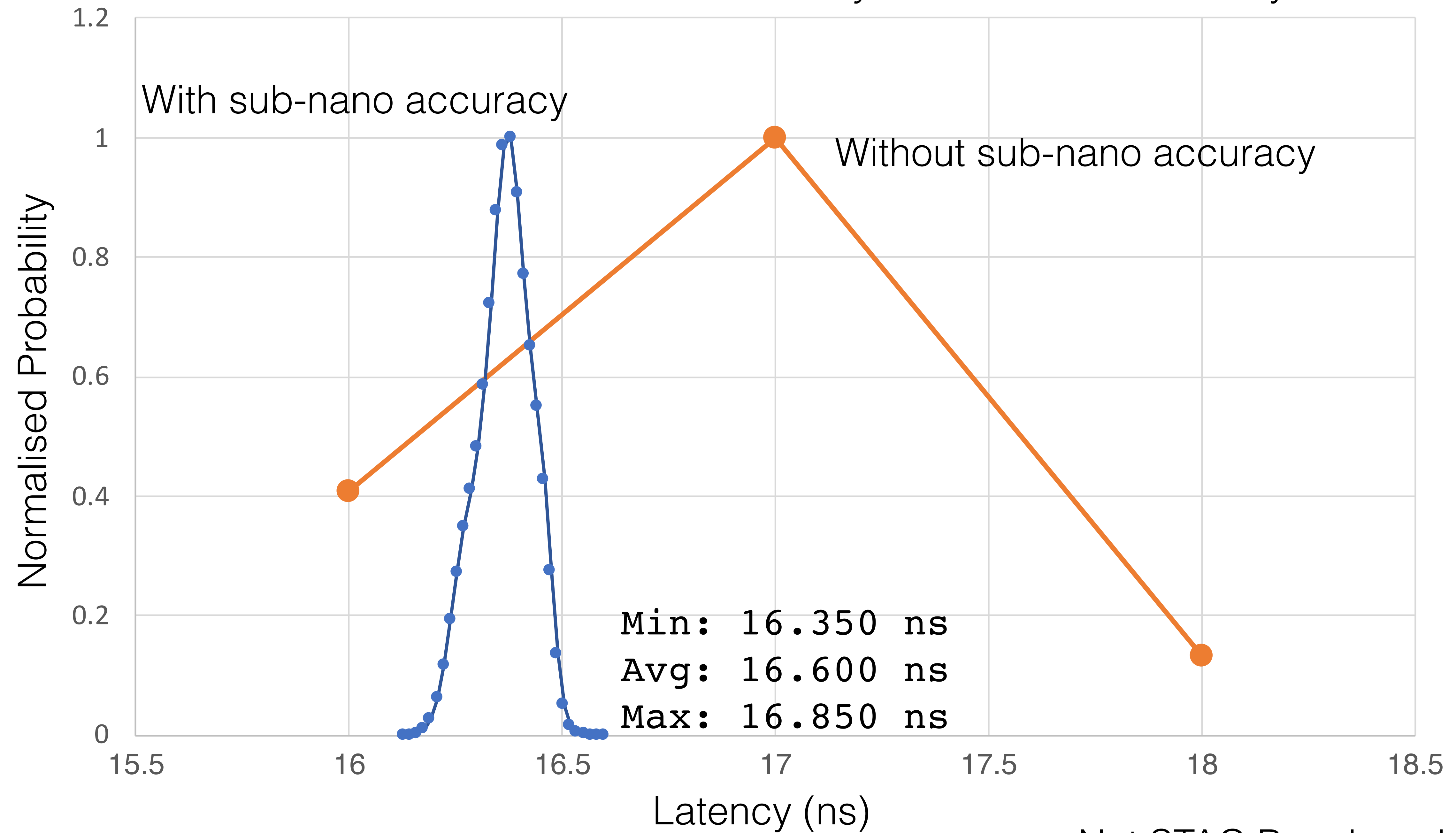
59.6 Billionths of a Nanosecond

MetaWatch *accuracy* — Measure the latency of a fibre



Not STAC Benchmark

MetaWatch *accuracy* — Measure the latency of a fibre





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#reveal experimental on



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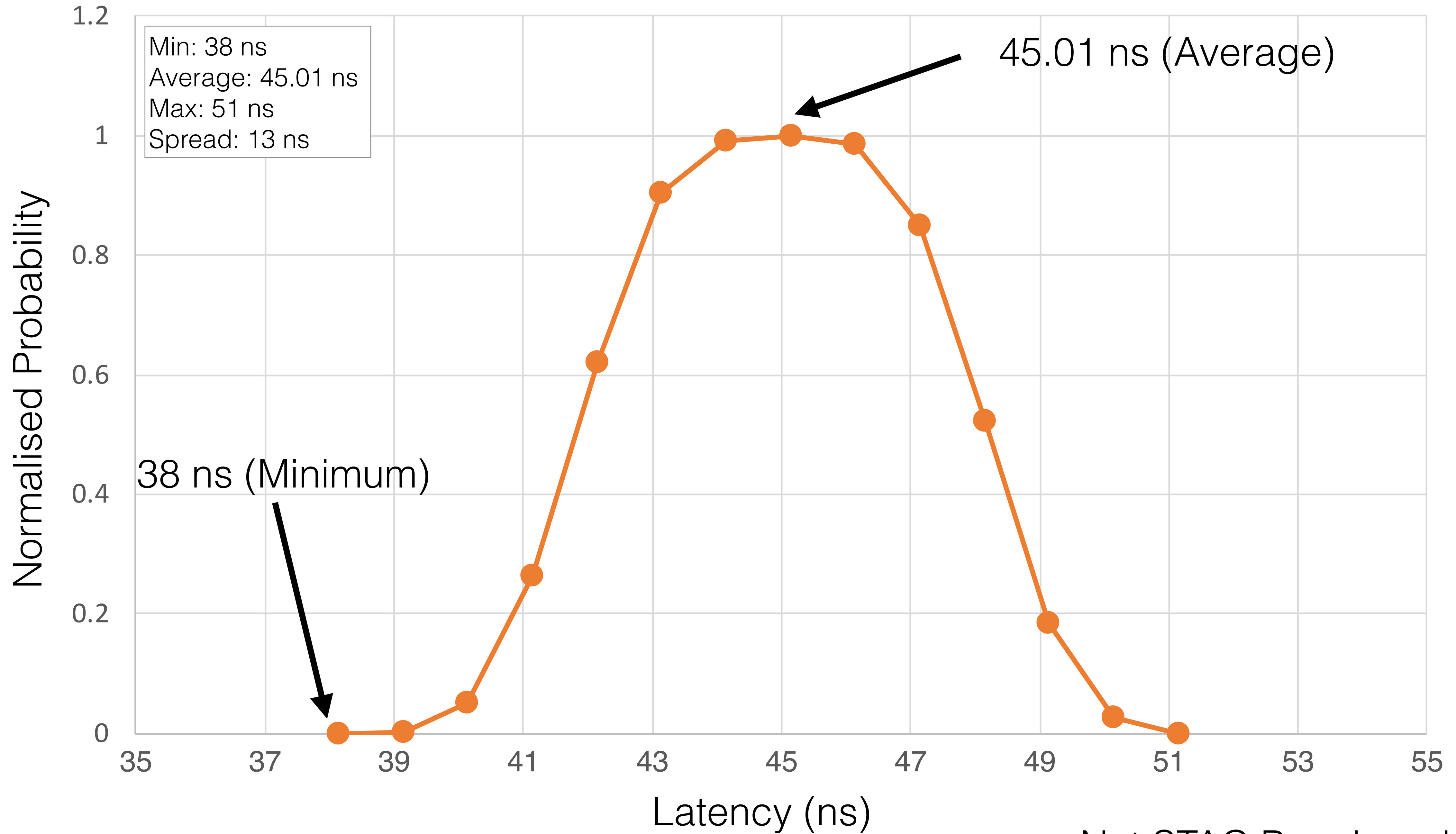
It's on the software portal...

metawatch-0.8.0alpha2

#reveal experimental on

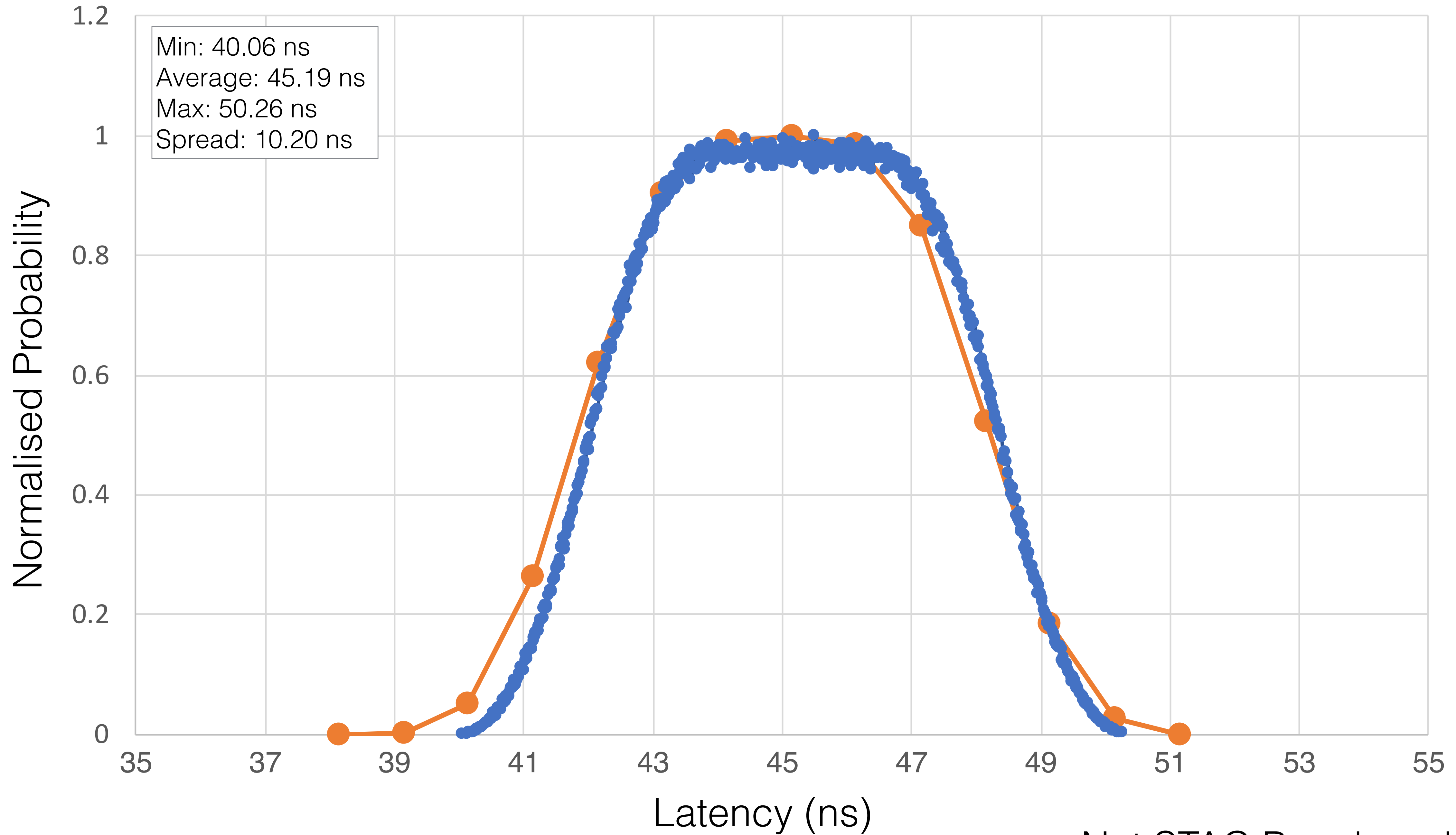
Measured with old-MetaWatch

metamux-3.0.0alpha1



Measured with new-MetaWatch

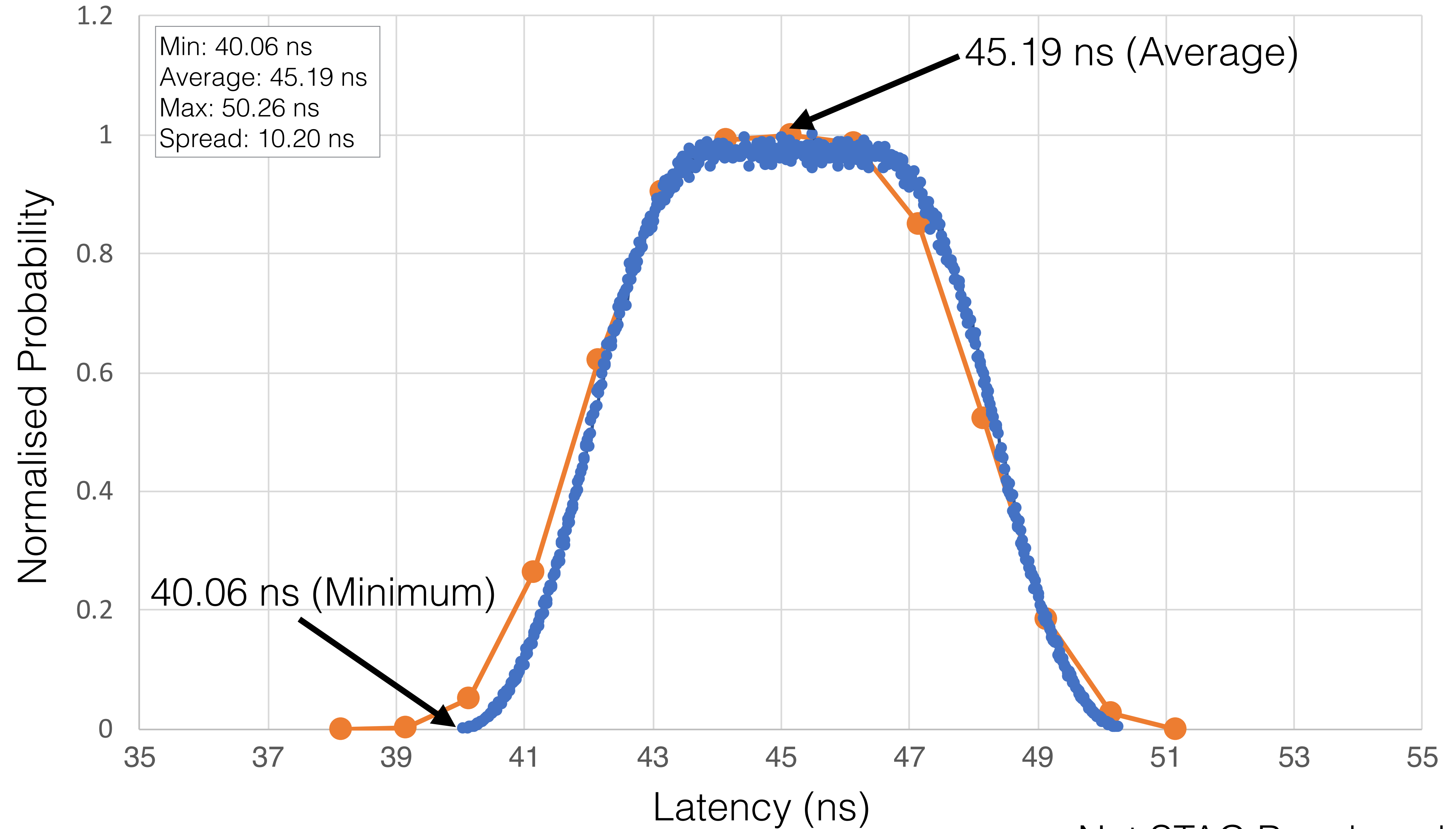
metamux-3.0.0alpha1



Not STAC Benchmark

Measured with new-MetaWatch

metamux-3.0.0alpha1



Not STAC Benchmark



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metamux-3.0.0alpha1



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