



Quantum Software & Tools @ IonQ

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01 **Current State**

02 **Plans for the Future**

03 **Thoughts for Today**

IonQ's Quantum Compute Offerings

We have three turnkey “compute offerings,” bucketed by **what the customer needs, where it will be installed, who will have access, and how it will be utilized.**

1. **IonQ Quantum Cloud**, our quantum-as-a-service offering that allows customers to buy and use quantum compute *time* alongside supporting value-add services, via fully-remote cloud access
2. **IonQ On-Premise**, turnkey quantum computer deployed to customer site, packaged with support, and *primarily* IonQ-provided infrastructure and services.
3. **IonQ Bare Metal**, a quantum computer deployed to a customer site, packaged without many or any IonQ platform services — for research-focused customers and joint GTM models.

IonQ also does quantum networking hardware, software, and services, “custom” computing products and research partnerships, a variety of professional services offerings (apps consulting, training, enablement, etc), and some space stuff now too apparently, but they’re not the focus of this presentation.

IonQ Quantum Cloud

IONQ

My Jobs

Projects

Backends

Settings

API Keys

Support

Documentation

API Reference

Support Requests

IonQ Internal Organization

🔔

👤

Backends

QPUs

Simulators

IonQ Forte

qpu.forte-1

Available

Show details

#AQ

36

Qubits

36

IonQ Forte Enterprise 1

qpu.forte-enterprise-1

Available

Show details

#AQ

36

Qubits

36

IonQ Aria 1

qpu.aria-1

Available

Hide details

#AQ

25

Qubits

25

Error values represent the 24-hour median and are automatically updated when there are enough data points within a defined time window.

Characterization data

all-to-all

0.030% (median)

1.210% (median)

SPAM Error

T1

T2

0.390% (median)

100 s

1 s

Characterization data taken at 2025-07-22 20:00:00 EDT

1Q Gate

2Q Gate

Readout

Reset

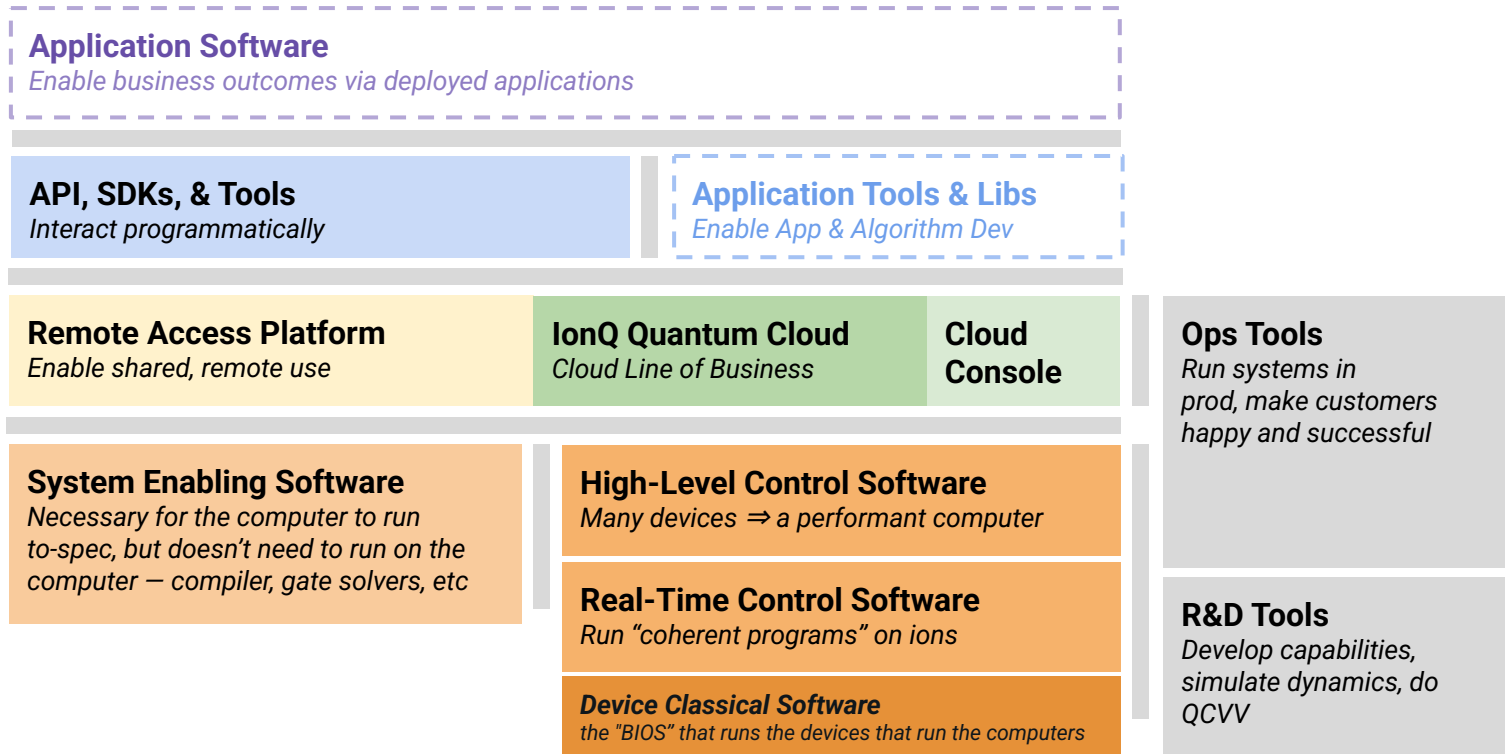
135 μs

600 μs

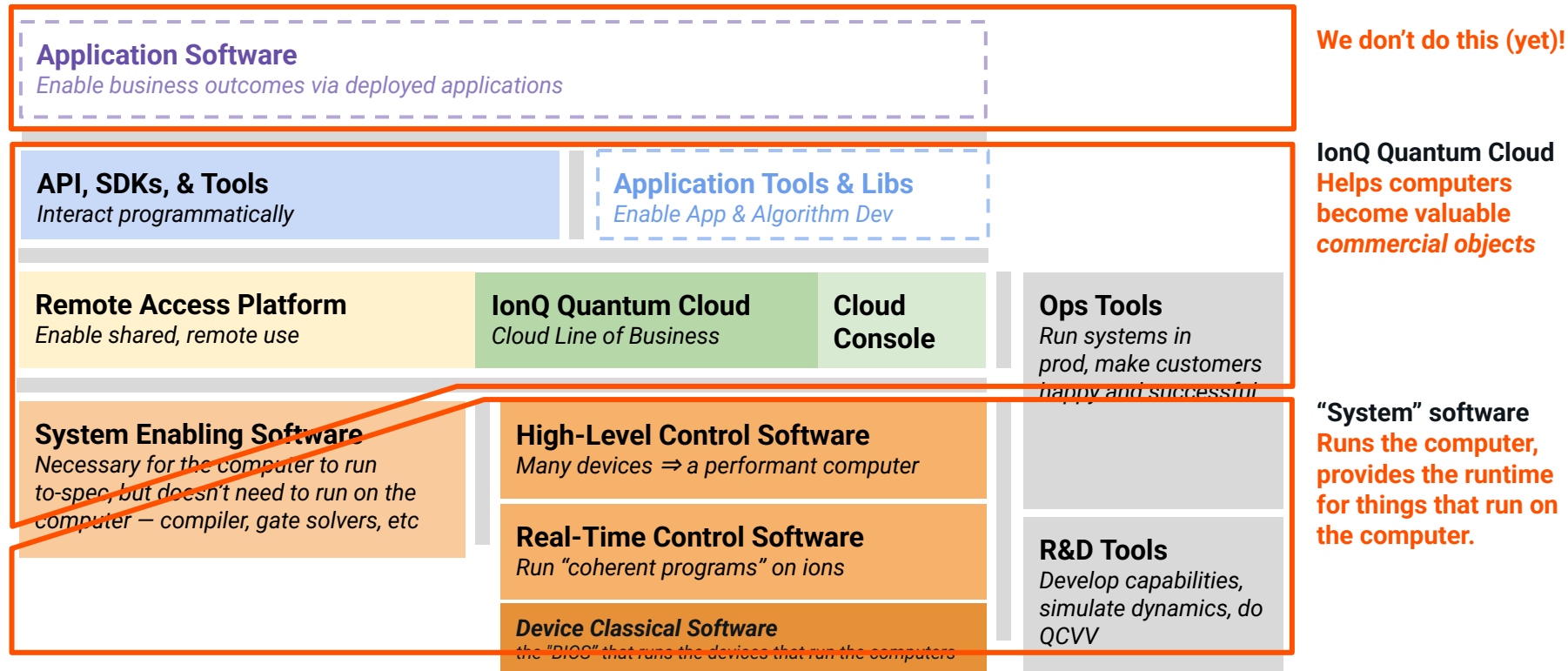
300 μs

20 μs

IonQ's Software & Tools Stack



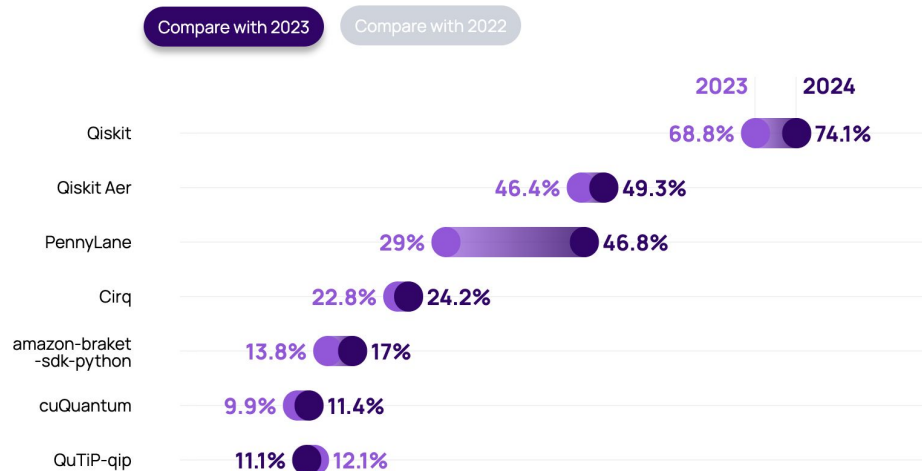
IonQ's Software & Tools Stack



SDKs & User Tools

18b) Full-stack development platforms and simulators: year comparison

Total answers: 629 (2024) - 535 (2023) - 468 (2022)

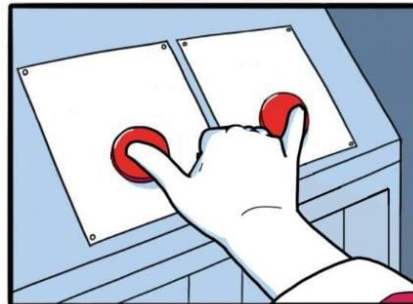
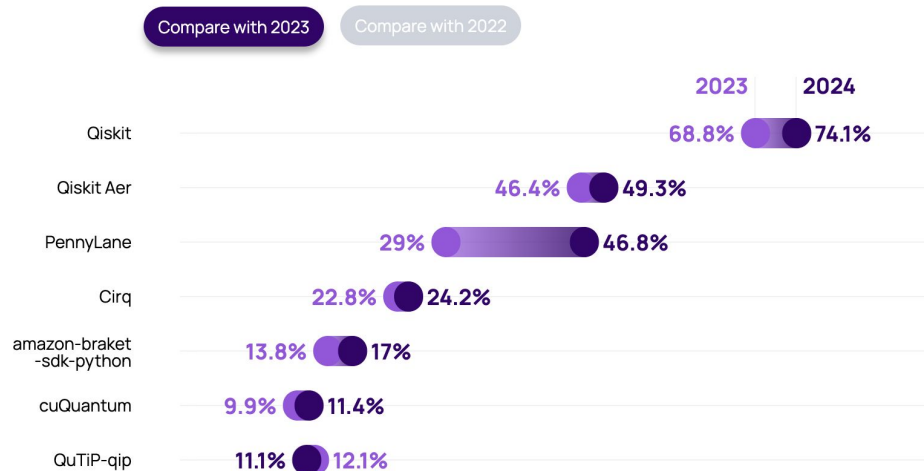


From <https://unitaryfoundation.github.io/survey-2024/>

SDKs & User Tools

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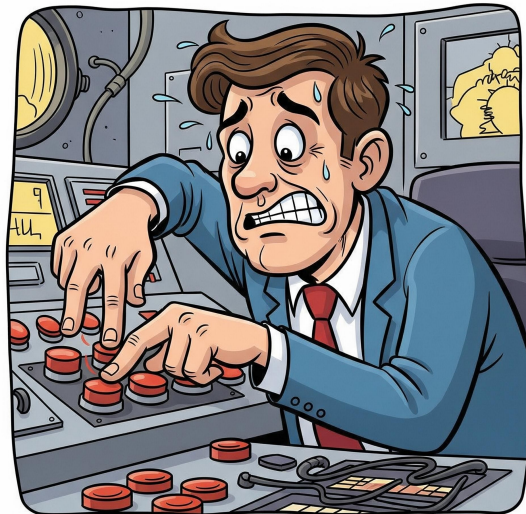
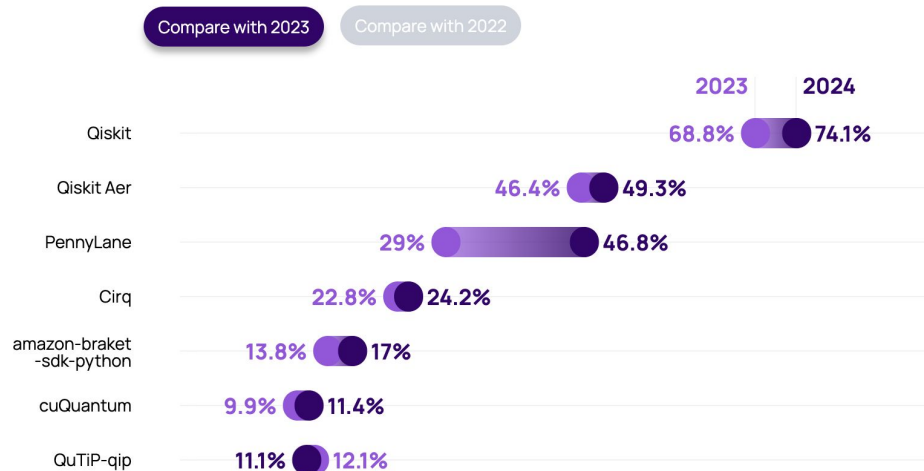


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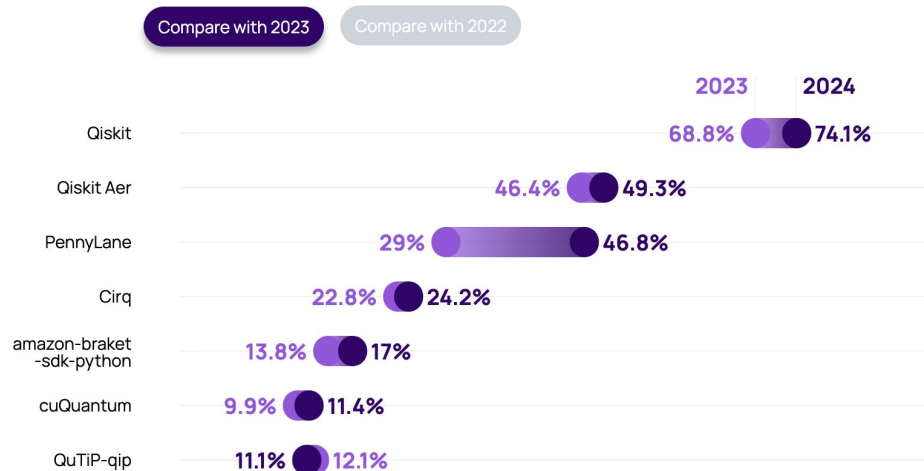


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Plans & Concerns For The Future

1. More user-facing tooling transparency, more compiler control
2. More built-in EM techniques, Options
3. Application-focused Function/Hybrid Infrastructure
4. More Scheduling Options & Integrations
5. Dynamic Circuit runtimes and “Reverse Offloading”
6. Our First On-Prem HPC Center Install (KISTI)

Thoughts for Today

1. I'd like to try and develop alignment on use cases, principles and goals **first**, then tools and frameworks
2. Identify the things that have genuine good reason to stay vendor specific, find common ground on the rest
 - The stuff it really does not make sense to do a bunch of times
 - Interfaces >>> Implementations
3. Interesting but not pressing: what tools/layers are we not even thinking about yet?
 - Profiling
 - Distributed QC (both intra- and inter-datacenter)
 - External Quantum Information (super-IRI)