Quantum Software & Tools @ IonQ

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IONQ

01 Current State

02 Plans for the Future

03 Thoughts for Today

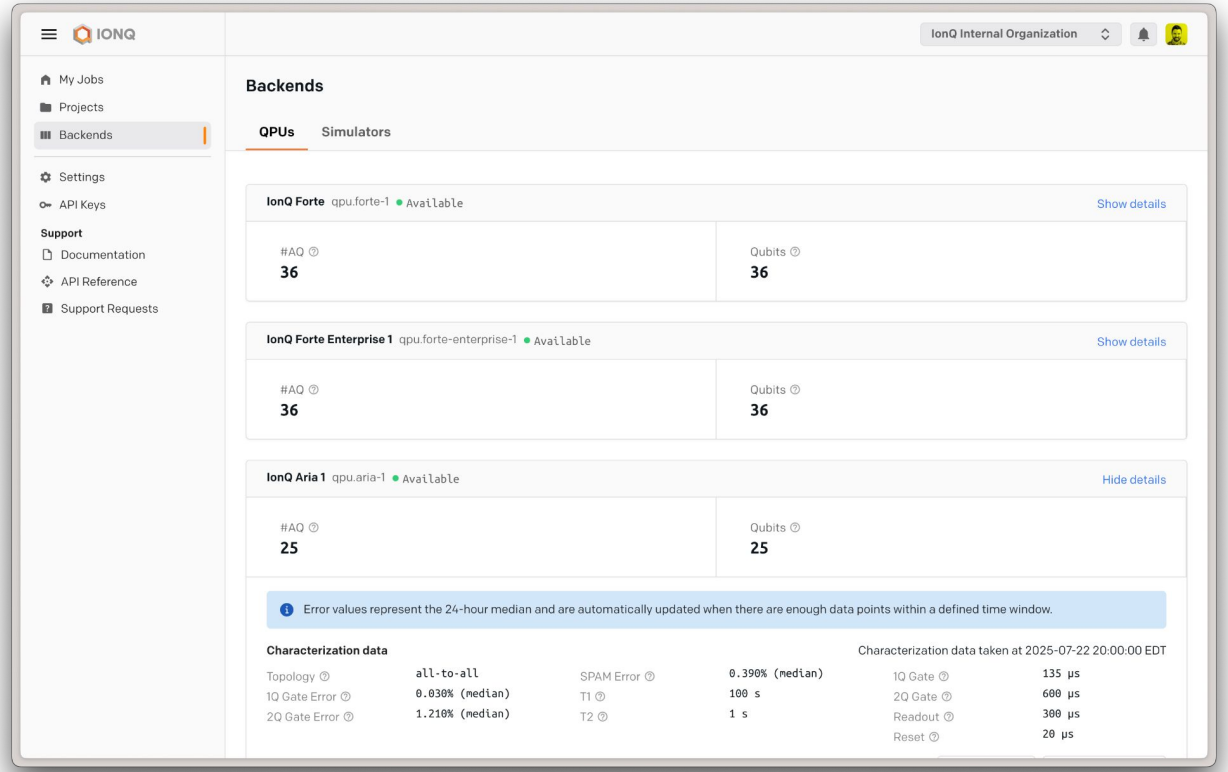
IonQ's Quantum Compute Offerings

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**.

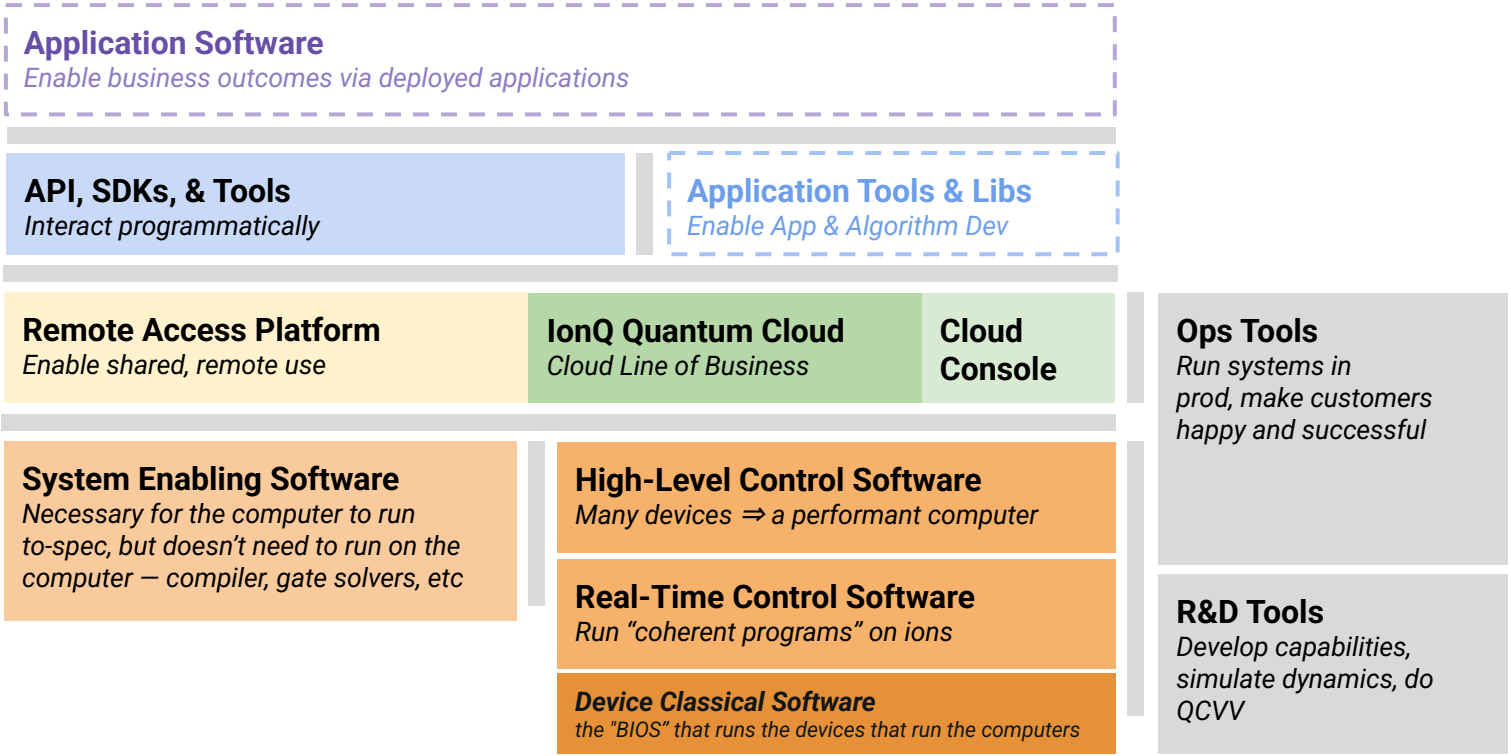
1. ***IonQ Quantum Cloud,*** our quantum-as-a-service offering that allows customers to buy and use quantum compute *time* alongside supporting value-add services, via fully-remote cloud access
2. ***IonQ On-Premise,*** turnkey quantum computer deployed to customer site, packaged with support, and *primarily* 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's Software & Tools Stack



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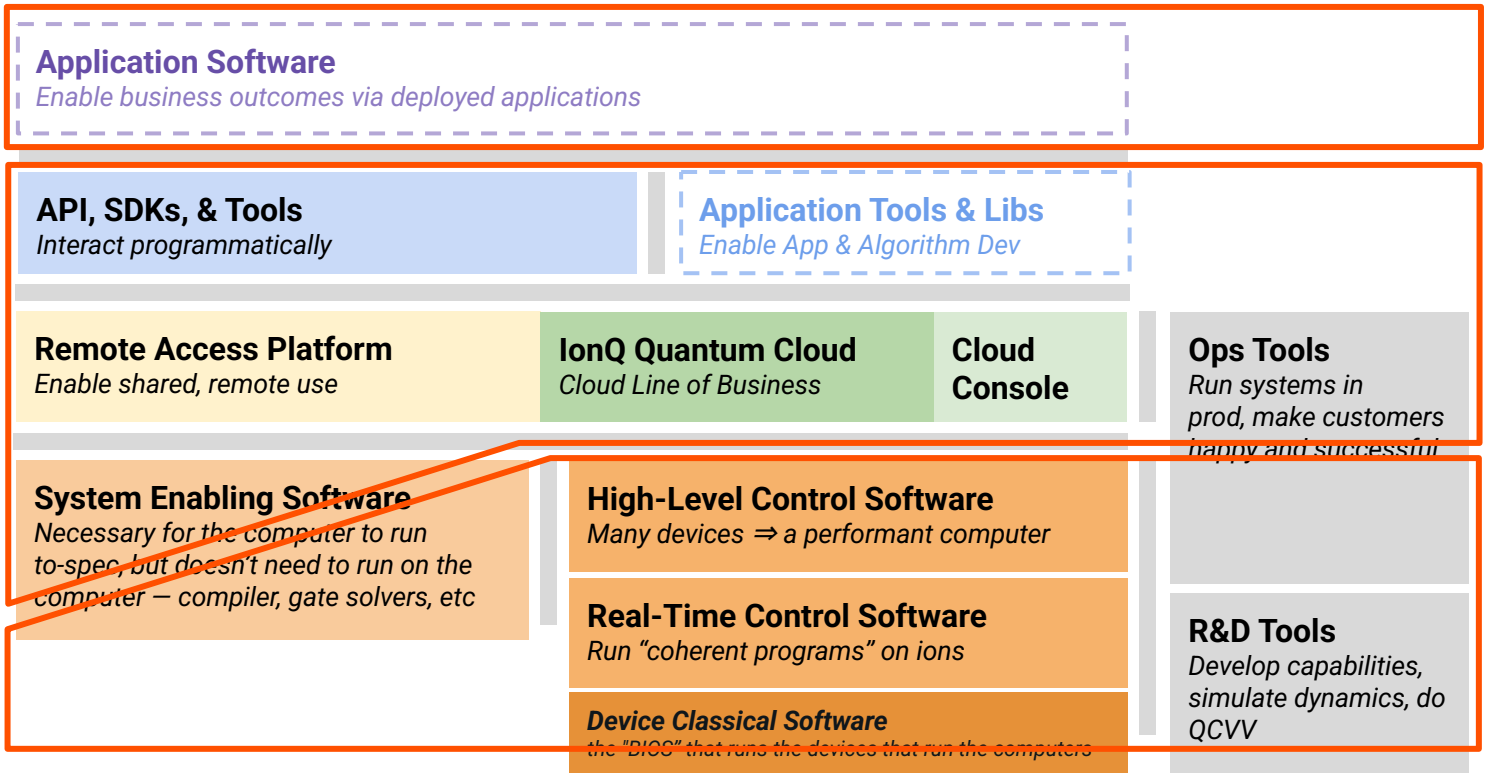
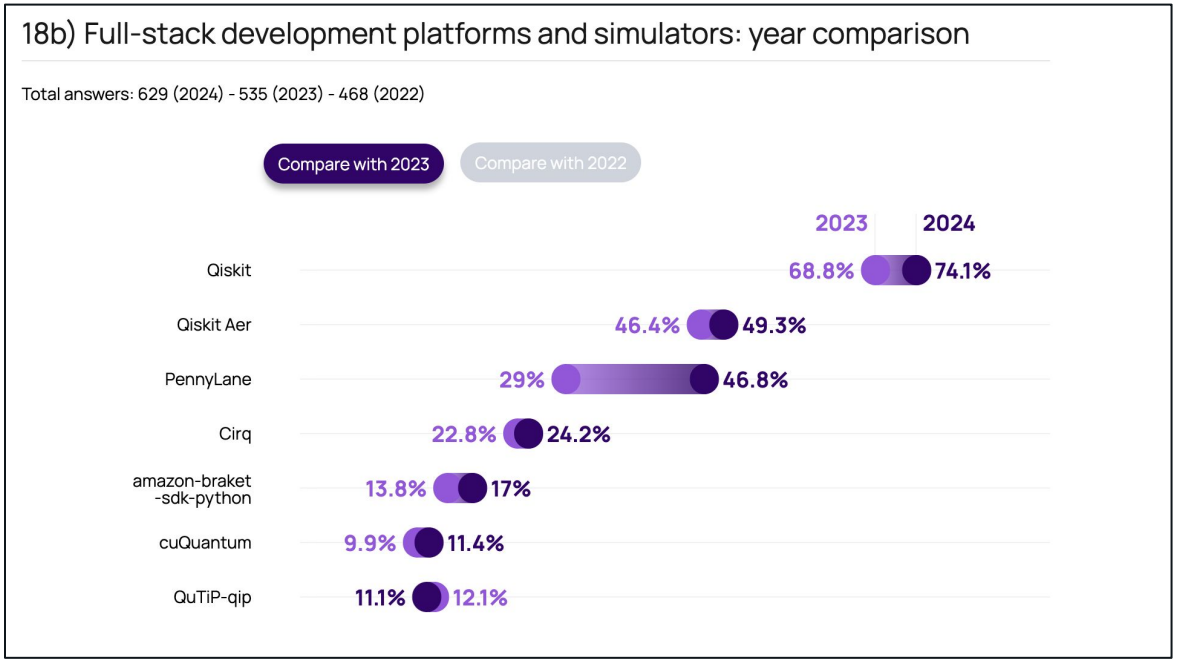


We don't do this (yet)!

IonQ Quantum Cloud
Helps computers become valuable *commercial objects*

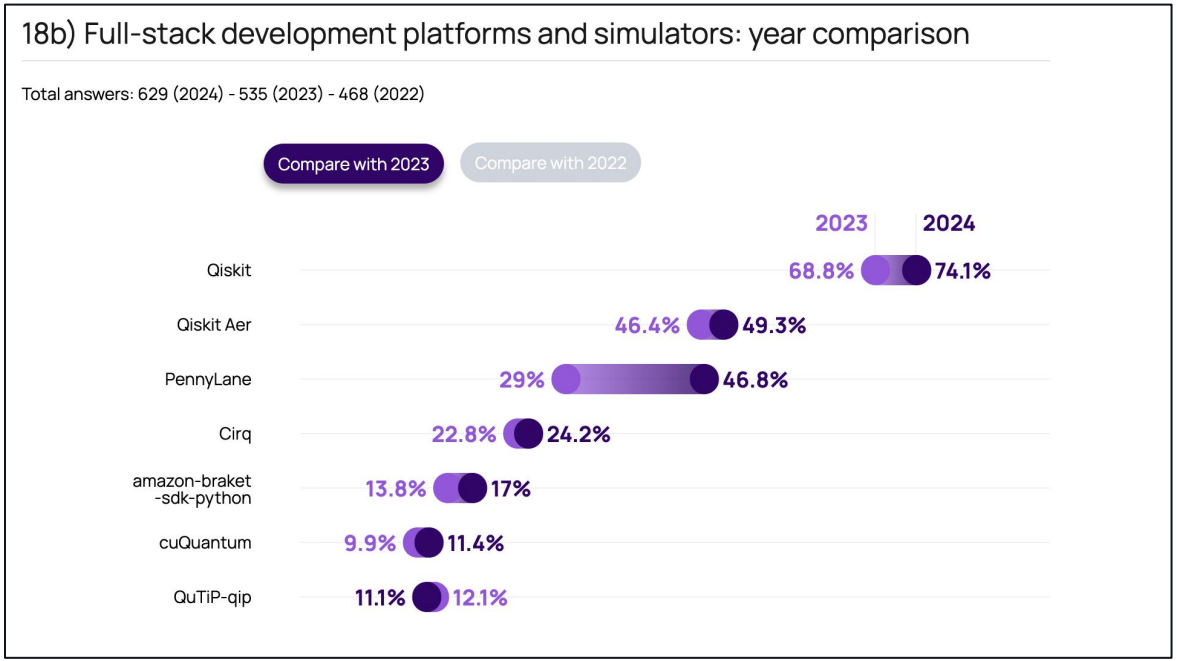
"System" software
Runs the computer, provides the runtime for things that run on the computer.

SDKs & User Tools



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

SDKs & User Tools



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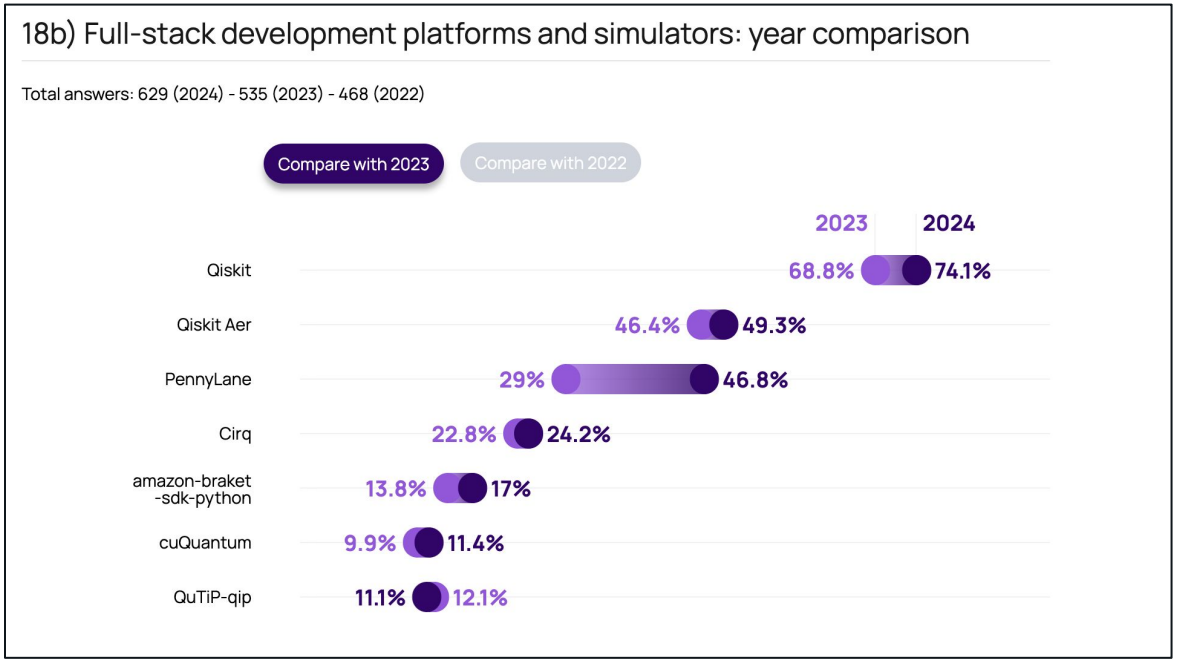

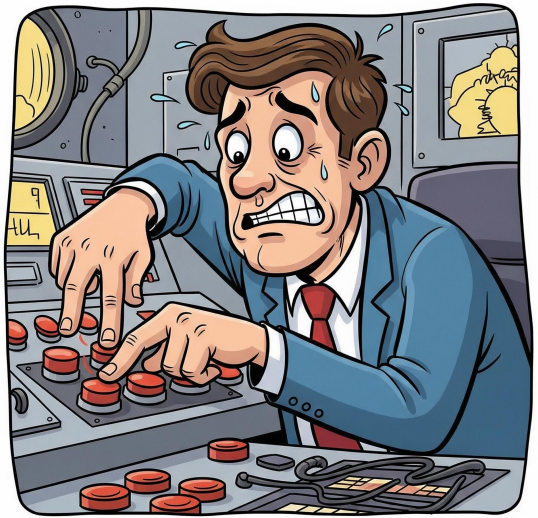

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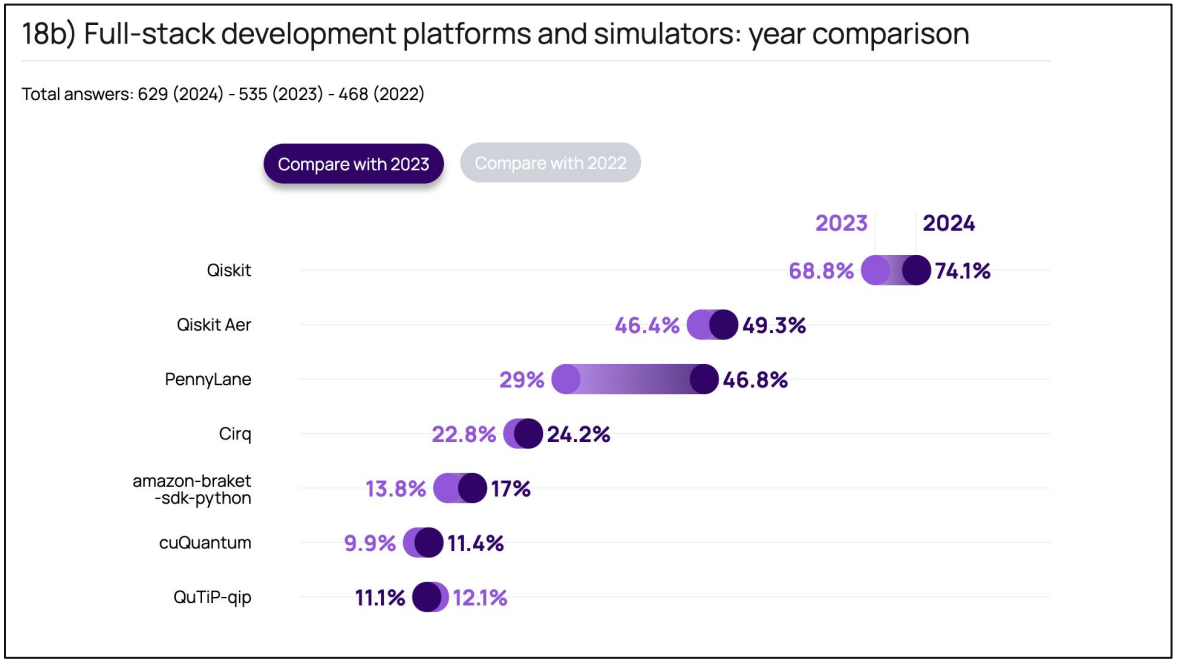

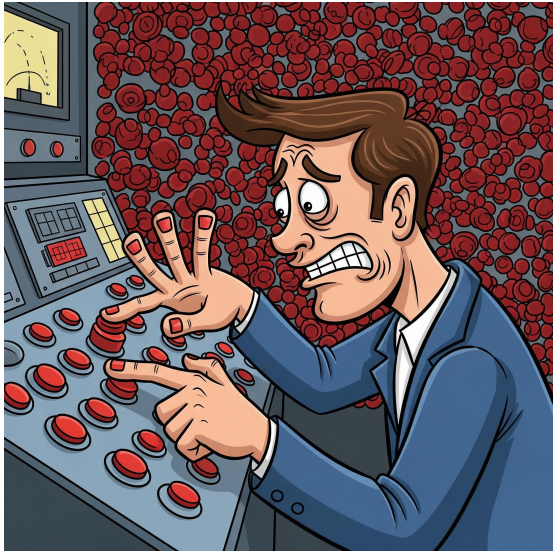

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Plans & Concerns For The Future

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)