
AWS
re:Invent
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QTC304-NEW

Get hands-on with NVIDIA CUDA-Q on Amazon Braket

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Potential applications

Logistics

Traffic routing, network optimization, manufacturing workflow

Machine learning

Reinforcement learning, search, sampling, neural networks

Finance

Portfolio selection, risk management, trading decisions

Agriculture

Manufacture fertilizer with less energy

Energy

Model photosynthesis for cheaper solar cells, battery tech, materials for carbon capture

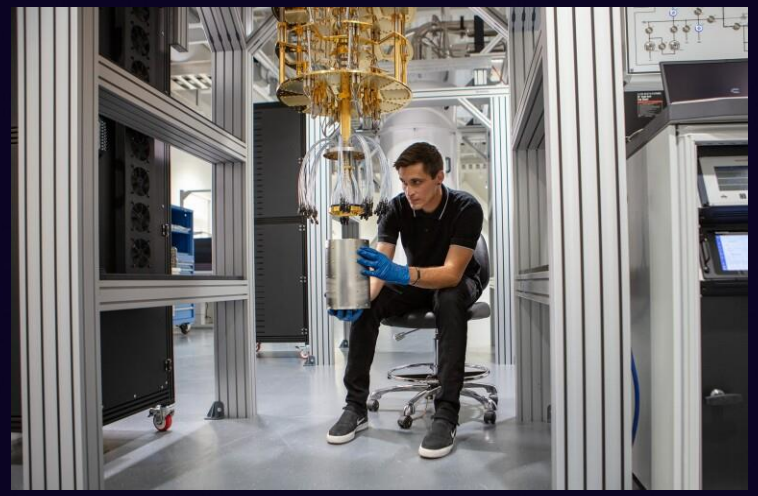
Pharma

Time-to-market for new drugs, molecular simulation to find stable configurations

From qubits to data centers

“If a company doesn’t do anything about the market right now . . . , when quantum advantage becomes real, it might be too late.”

Marco Pistoia, Head of Global Technology Applied Research, JP Morgan Chase



Amazon Braket

Quantum Computing Made Accessible

Choice of quantum hardware

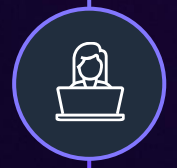
Consistent user experience

Reservation or pay-as-you-go access

It’s all about reducing risk and spotting opportunities

Avoid technology lock-in

Reducing the cost of experimentation



Fast learning curve

Quantum computers available on Amazon Braket

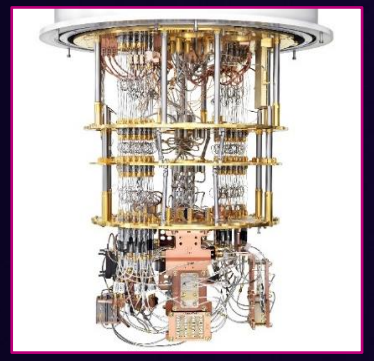
IONQ

Ion-trap QPUs

Aria (25 qubits)

Forte (36 qubits) New!

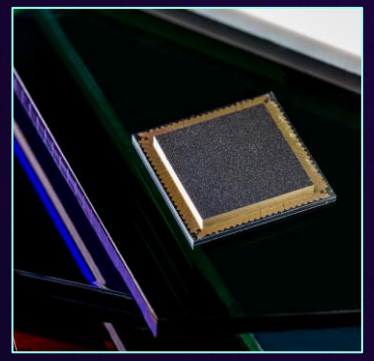
rigetti



Superconducting QPU

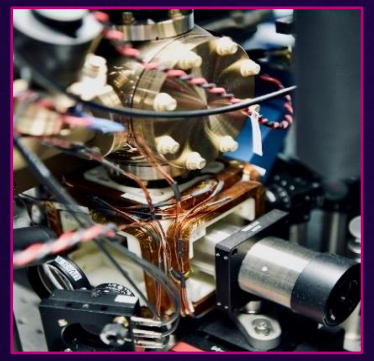
Ankaa-2 (84 qubits)

IQM



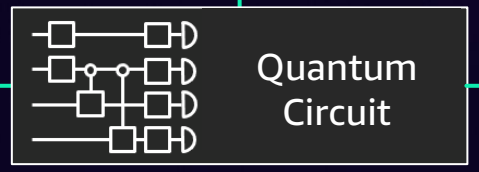
Superconducting QPU

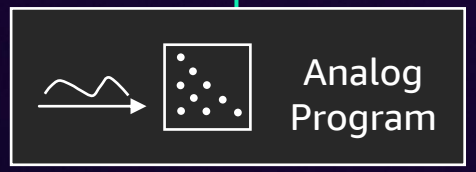
Garnet (20 qubits)



Analog neutral atom QPU

Aquila (256 qubits)





https://aws.amazon.com/braket/quantum-computers/

Quantum for high performance computing

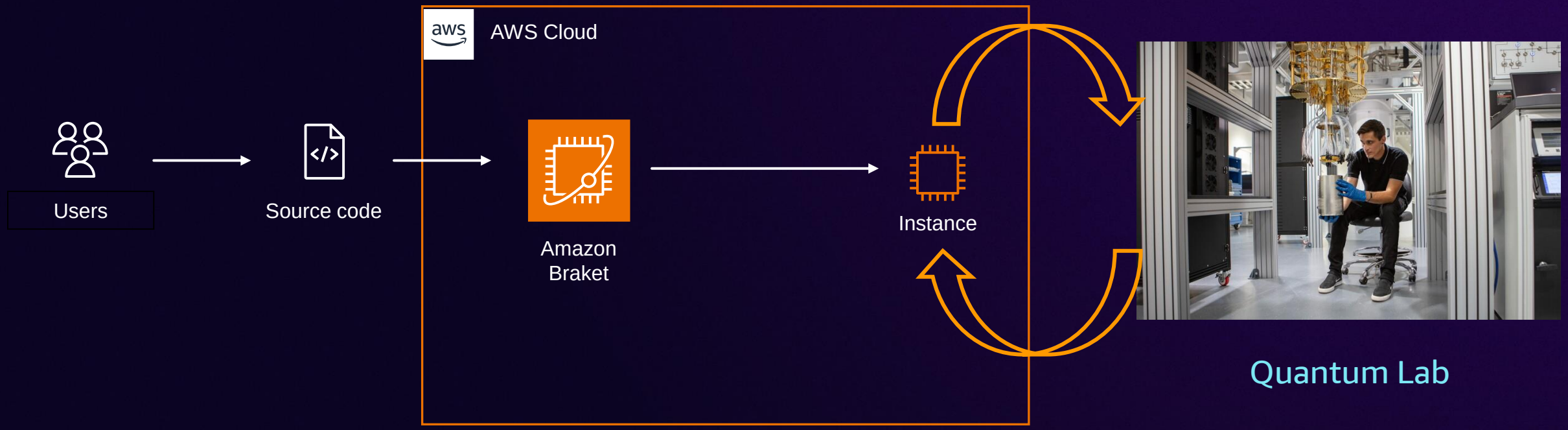
What do all these use cases have in common?

Quantum for high performance computing

What do all these use cases have in common?

They’re all pushing the boundaries of present day classical high performance computing!

Today: Classical and “quantum” data centers



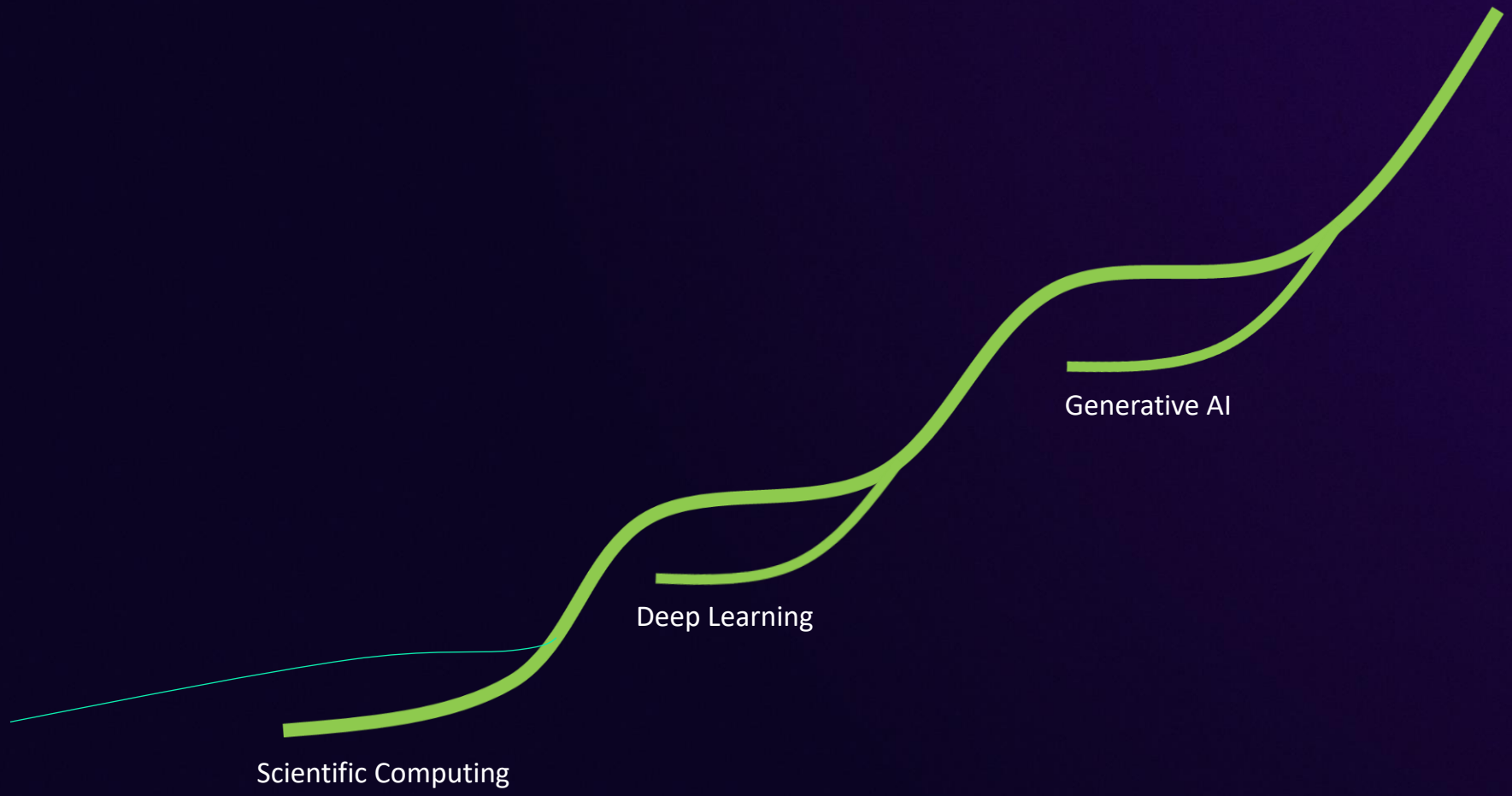
Tomorrow: Data centers

Accelerated Quantum Supercomputing at NVIDIA

Jin-Sung Kim

(he/him)
Developer Relations Manager
NVIDIA

NVIDIA's History of Enabling Computing Revolutions



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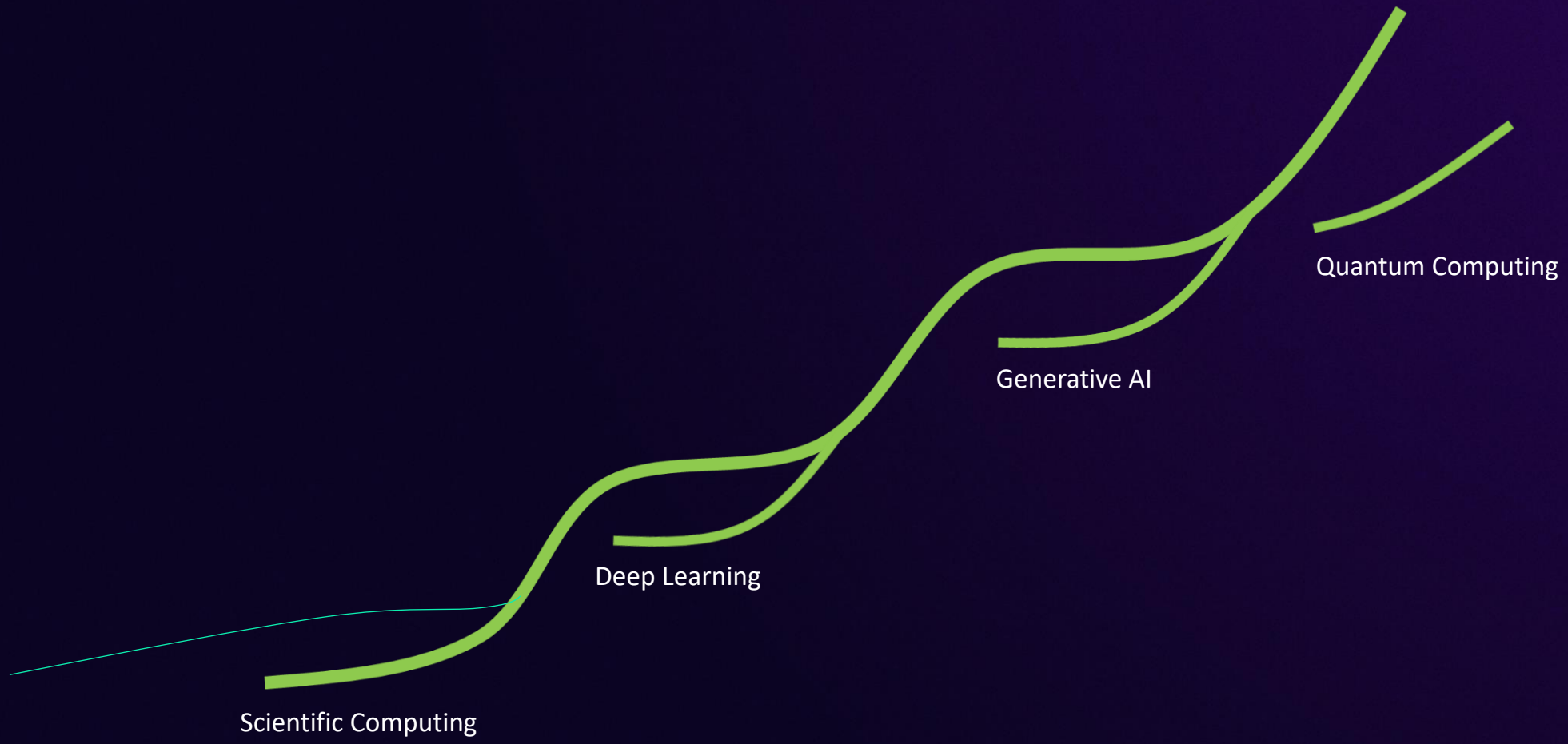

The Accelerated Quantum Supercomputer

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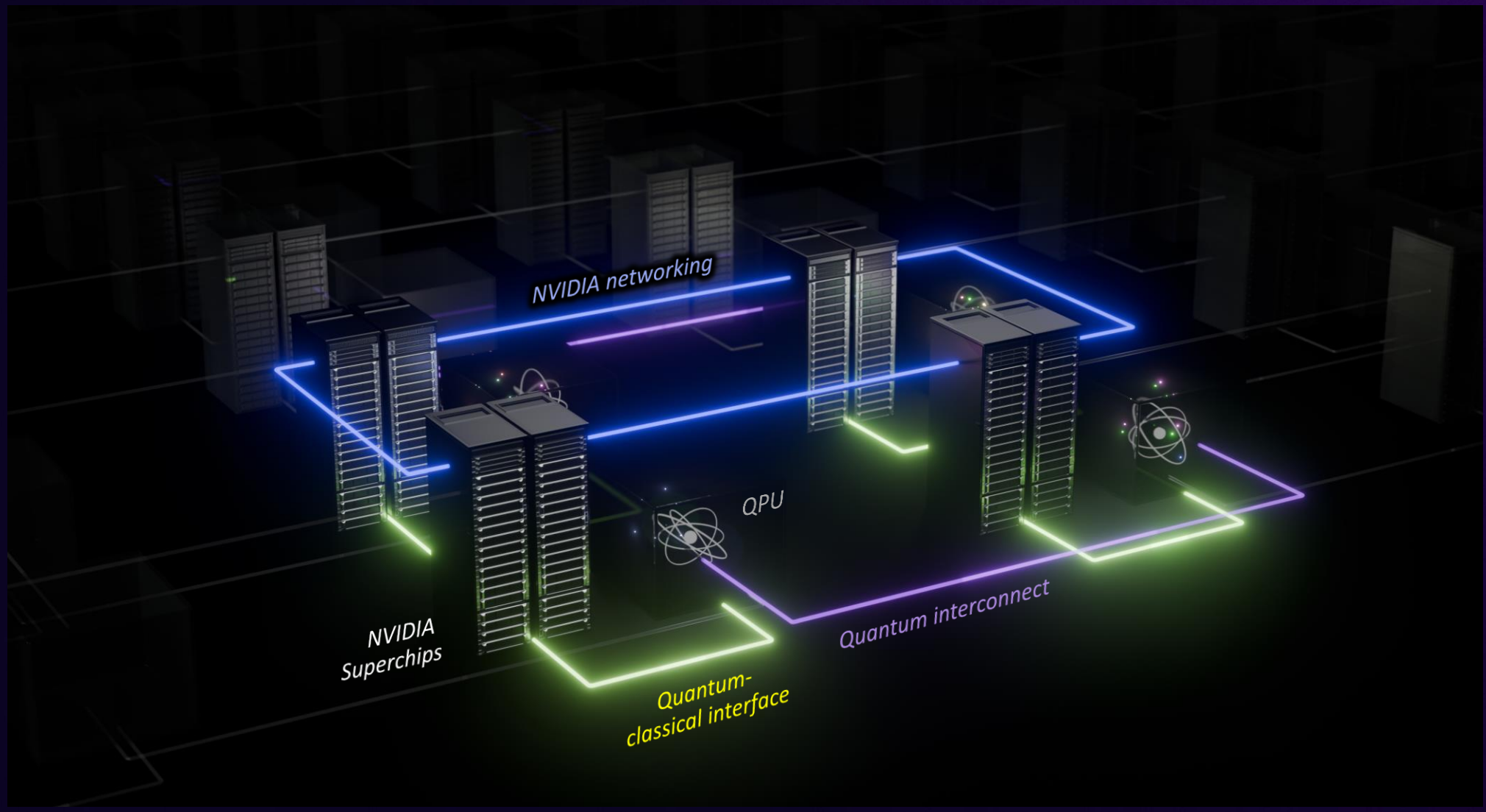
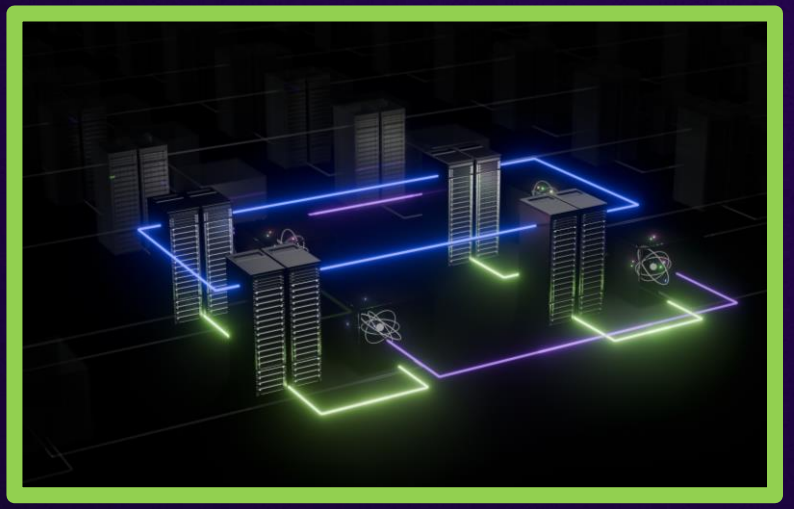
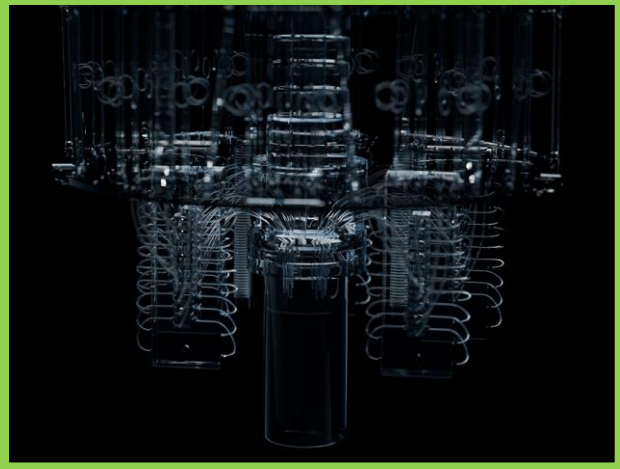


NVIDIA and AWS role in the industry



Accelerated Quantum Supercomputers

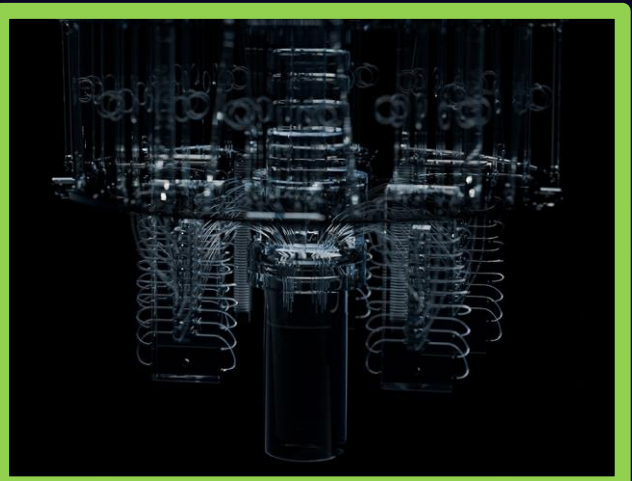
NVIDIA and AWS role in the industry

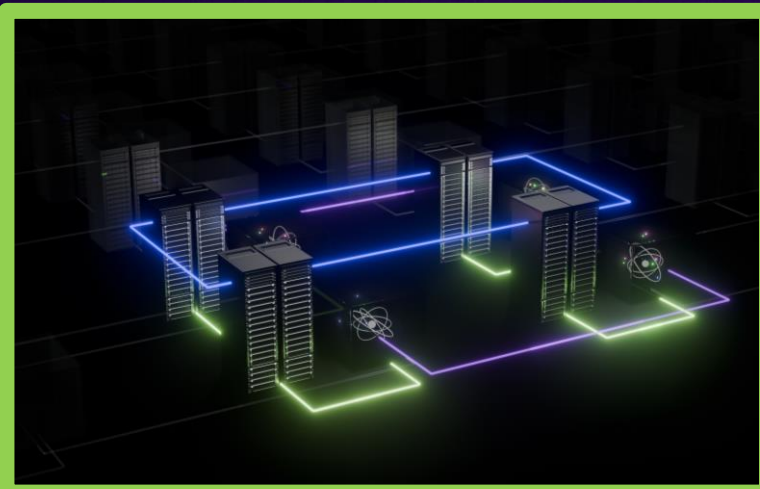


Qubits

Accelerated Quantum Supercomputers

NVIDIA and AWS role in the industry





Qubits

Better quantum hardware

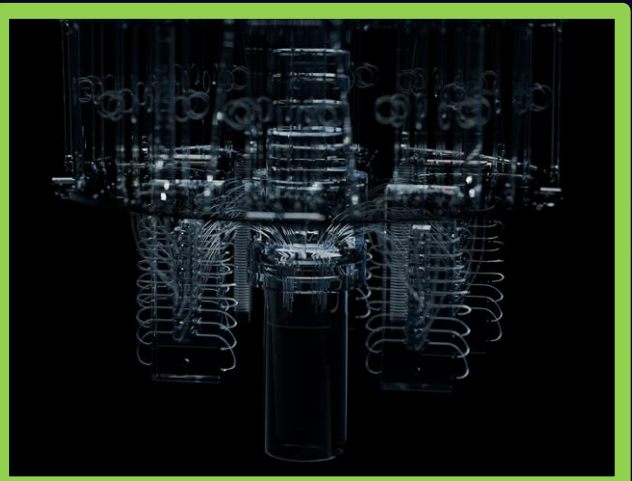
Hybrid algorithms

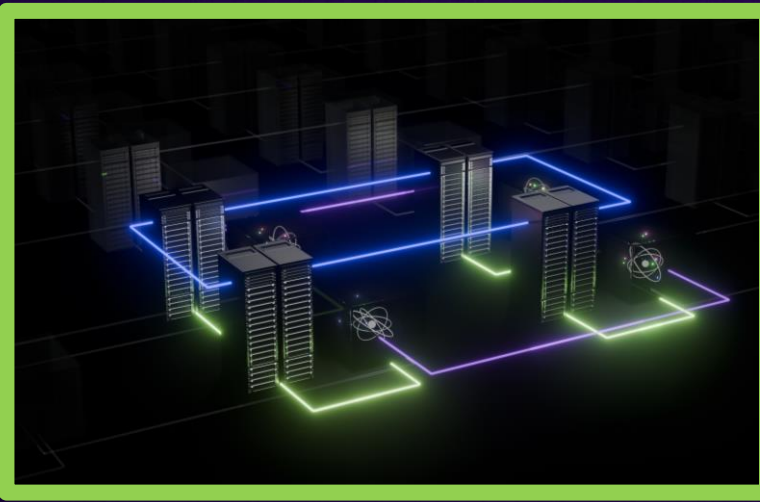
Implementing QEC

Infrastructure challenges

Accelerated Quantum Supercomputers

NVIDIA and AWS role in the industry





Qubits

Better quantum hardware

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Accelerated Quantum Supercomputers

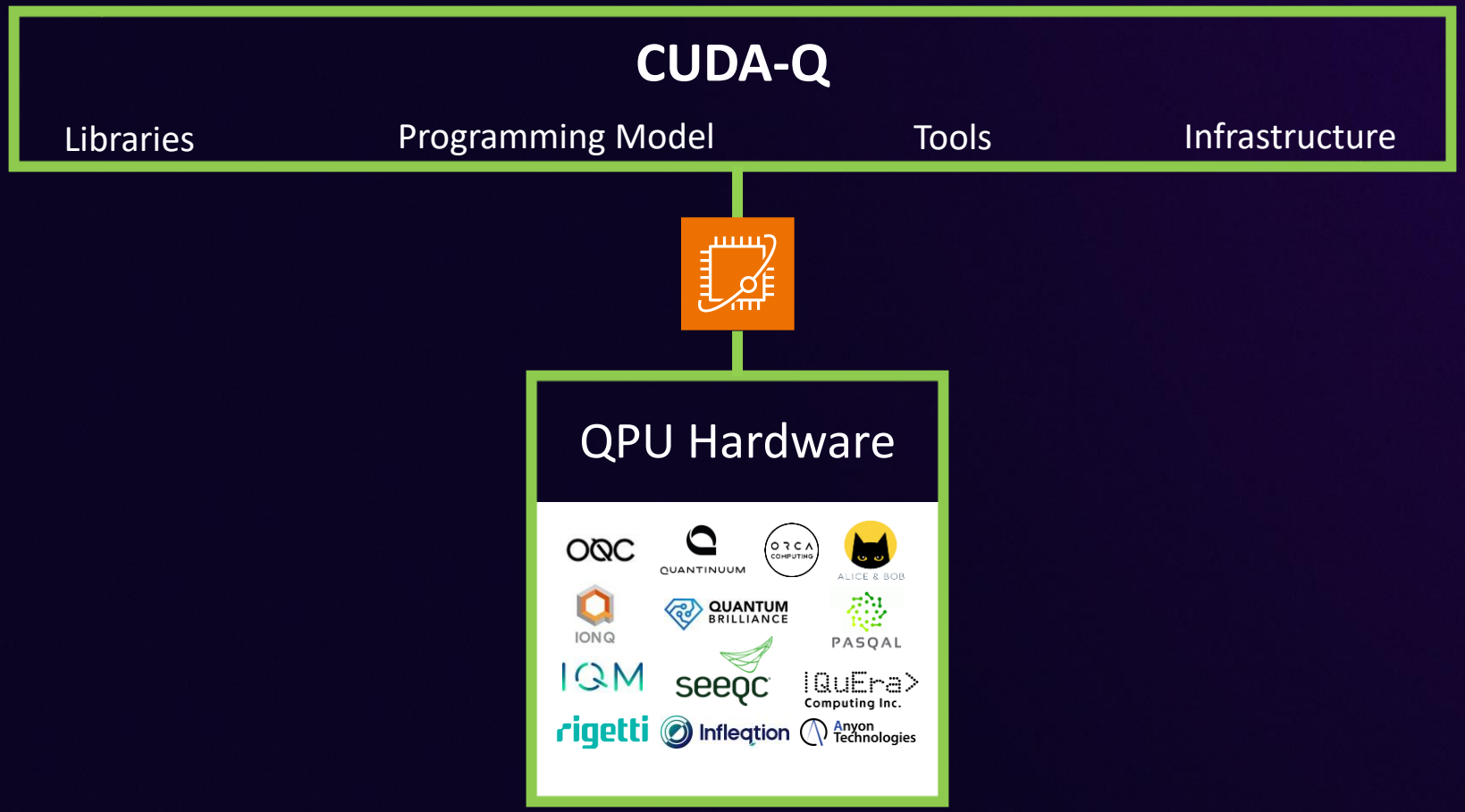
NVIDIA

AI supercomputing

Amazon Braket support for CUDA-Q

NEW!

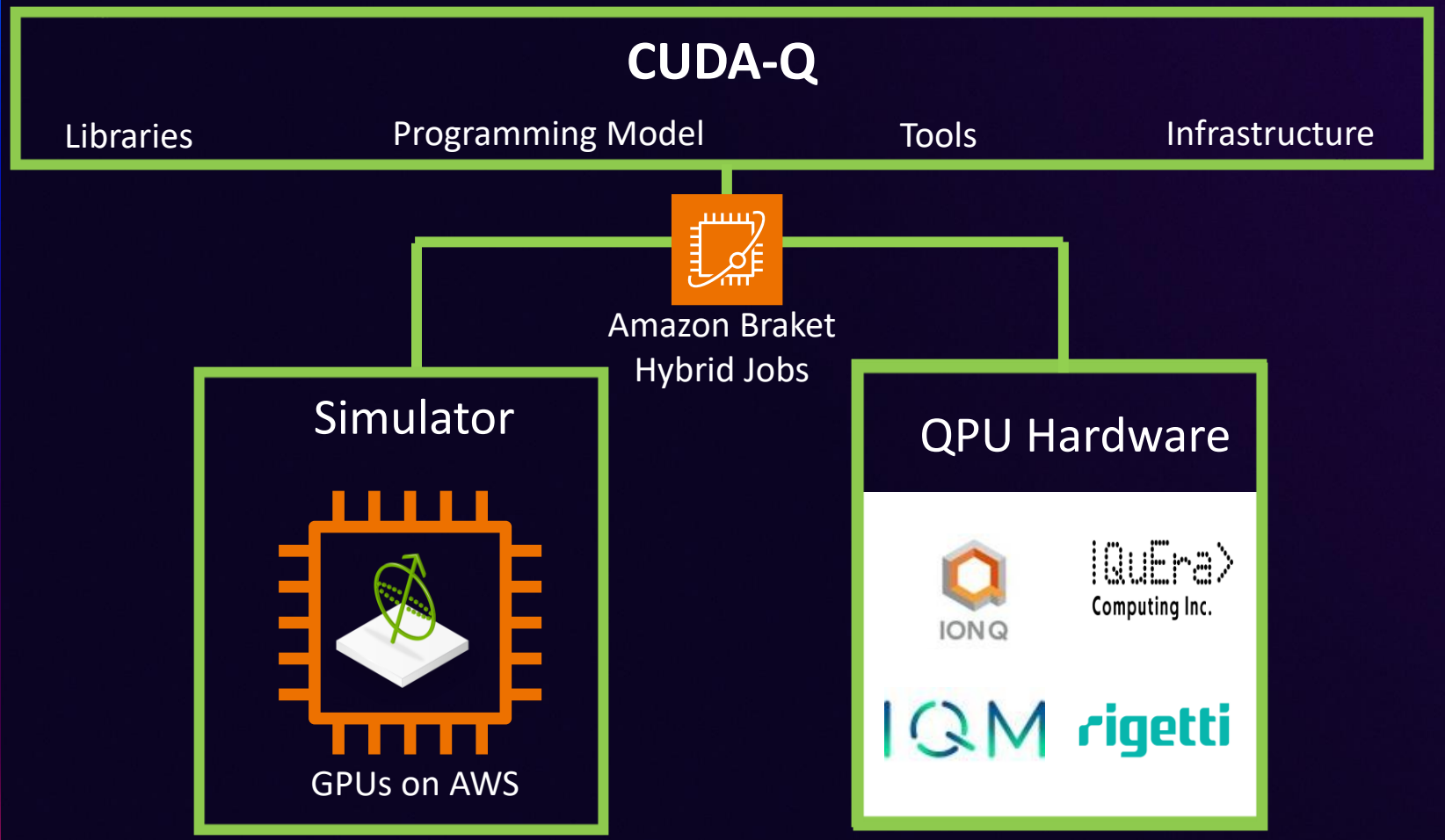
THE PLATFORM FOR ACCELERATED QUANTUM SUPERCOMPUTING



- Seamless access to quantum hardware
- Consistent user experience
- Pay-as-you-go pricing

Amazon Braket Hybrid Jobs support for CUDA-Q

NEW!



- Fully-managed access to elastic NVIDIA GPU capacity for large-scale simulations
- Seamless access to quantum hardware
- Consistent user experience
- Pay-as-you-go pricing

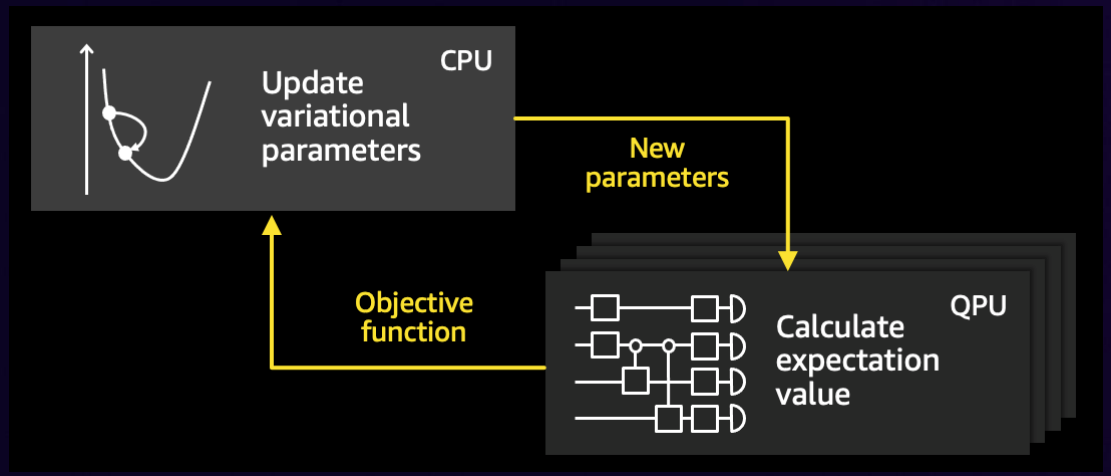
Demo: Running CUDA-Q on Amazon Braket

Katharine Hyatt, PhD

(she/her)
Sr. Applied Scientist
Amazon Web Services

Hybrid quantum-classical algorithms

Classical and quantum units act as co-processors, executing subroutines of a larger computation

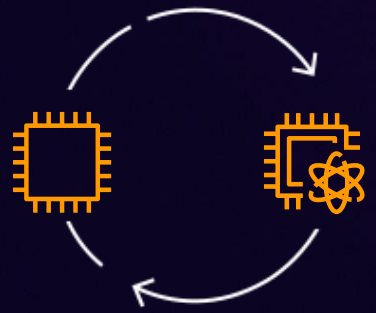


Advanced workloads require fast and reliable execution of thousands of tasks

Set up and maintain classical environment

Monitor convergence/progress

Make sure algorithm executes fast to avoid device drift



Amazon Braket Hybrid Jobs

Fully managed execution of hybrid quantum-classical algorithms on AWS

Demo: CUDA-Q Bell Circuit

Environment setup and configuration

Configure AWS credentials and select the appropriate backend for seamless integration with quantum hardware

Quantum circuit implementation

Write, compile, and execute a Bell state quantum circuit example leveraging both CUDA-Q's programming model and quantum resources available through Braket

Hardware flexibility and execution

Dynamically switch between different quantum processors, specifically demonstrating execution on IQM's Garnet QPU and GPU-accelerated quantum simulation, all through a unified programming interface

Scan Me:
Hello CUDA-Q on Braket

How can you get ready?

Amazon Braket Digital Badge

Certified learnings for quantum on AWS

Quantum Embark

Understand use cases and get hands-on. Connect with your account teams to learn more.

Integration of CUDA-Q with Amazon Braket

Get started with GPU-based simulations using CUDA-Q on Braket

AWS Quantum Solutions Lab

Leverage AWS Professional Services and AWS Partners to explore industry use cases

Amazon Braket Direct

Experts get early access to capabilities from our hardware and software partners

Quantum technolgies sessions at re:Invent

Day	Time	Session
Mon, Dec 2	8:30 AM – 10:30 AM	QTC201-R | Amazon Braket: Get hands-on with quantum computing
	8:30 AM – 9:30 AM	QTC303-R | Quantum computing and AI with Amazon Braket
	1:30 PM – 2:30 PM	QTC202 | Accelerating R&D outcomes in quantum computing using Amazon Braket
	5:30 PM – 6:30 PM	QTC304 | Get hands-on with NVIDIA CUDA-Q on Amazon Braket
	5:30 PM – 6:30 PM	QTC204-R | Accelerating enterprise innovation with Quantum Embark
Wed, Dec 4	8:30 AM – 10:30 AM	QTC201-R1 | Amazon Braket: Get hands-on with quantum computing
	8:30 AM – 9:30 AM	QTC205 | Empowering the supercomputing community with Amazon Braket
	11:30 AM – 12:30 PM	QTC303-R1 | Quantum computing and AI with Amazon Braket
	2:30 PM – 3:30 PM	QTC204-R1 | Accelerating enterprise innovation with Quantum Embark
	4:30 PM – 5:30 PM	QTC203 | Navigating the enterprise journey of quantum computing with AWS
	5:30 PM – 6:30 PM	QTC302 | Quantum computing empowering classical workflows in technical computing
Thu, Dec 5	3:00 PM – 5:00 PM	QTC301 | Exploring hybrid quantum-classical computation with Amazon Braket

Thank you!

Please complete the session survey in the mobile app

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