

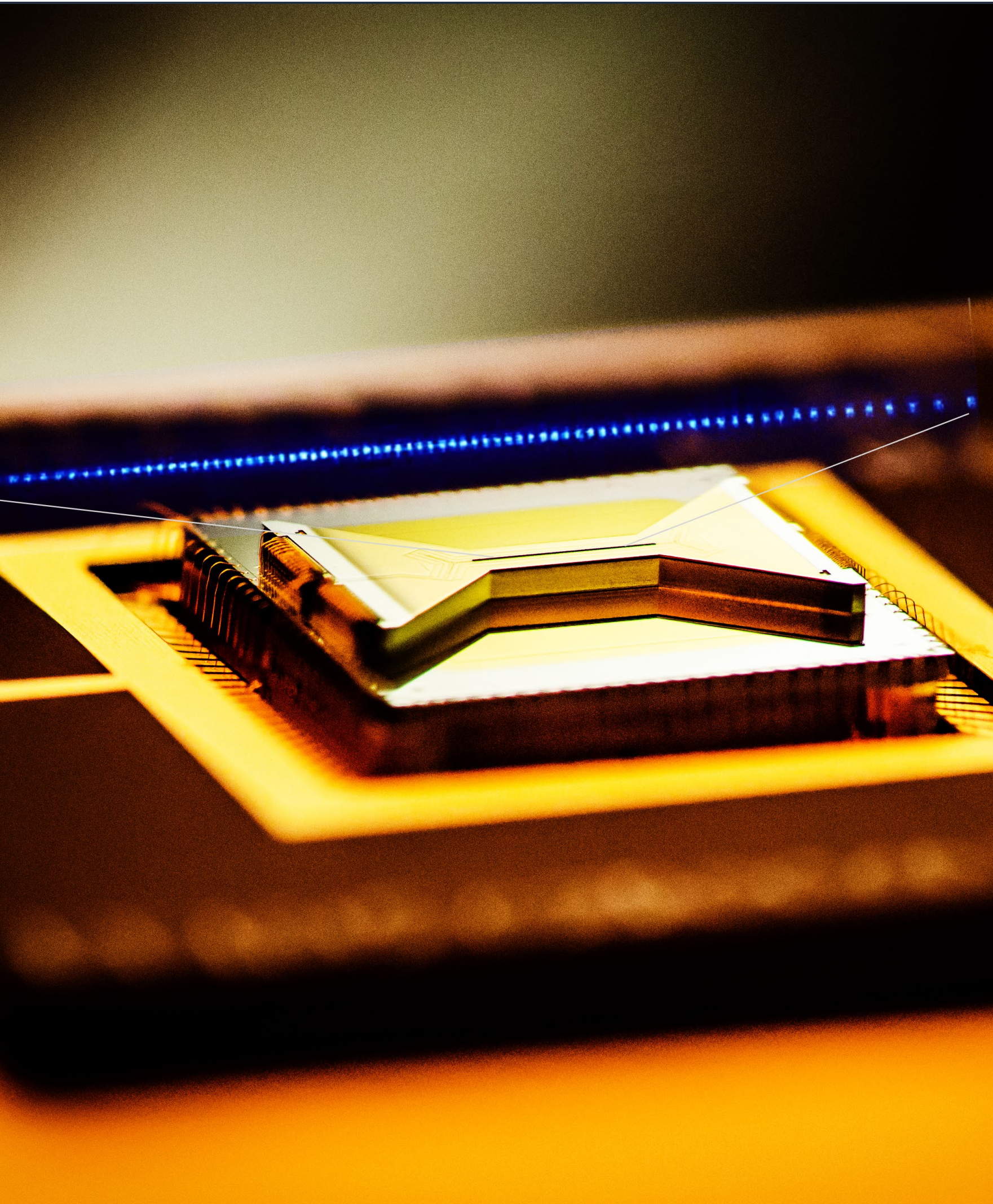
Introduction to Quantum Computing on AWS

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Amazon Web Services

Quantum Computing



- ... leverages the intricate physical laws of the microscopic world to perform computation in novel and improved ways

- A new paradigm in computing: Speed up solutions to hard problems. Not $10\times$ performance improvement but 10^x

- Hard scientific and engineering challenge to build quantum hardware at scale

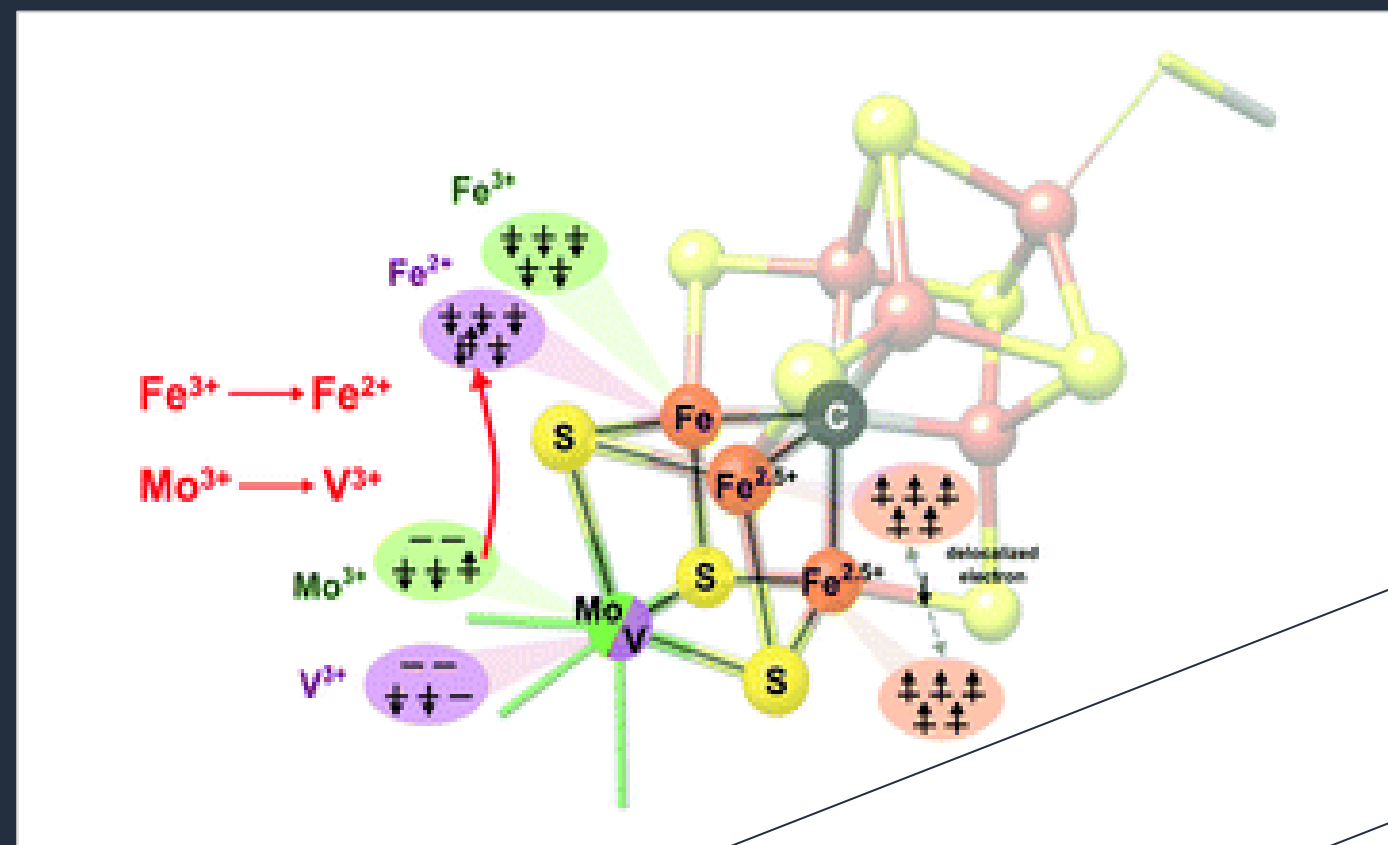
- We just entered the *Noisy Intermediate-Scale Quantum* (NISQ) era: far from end goal but promising for early explorations

Left: Ion trap quantum computer, IonQ

What are potential applications?

Quantum computing is tailored for **low throughput/high complexity problems**

Computational Chemistry



Nitrogen fixation

~ 200 qubits

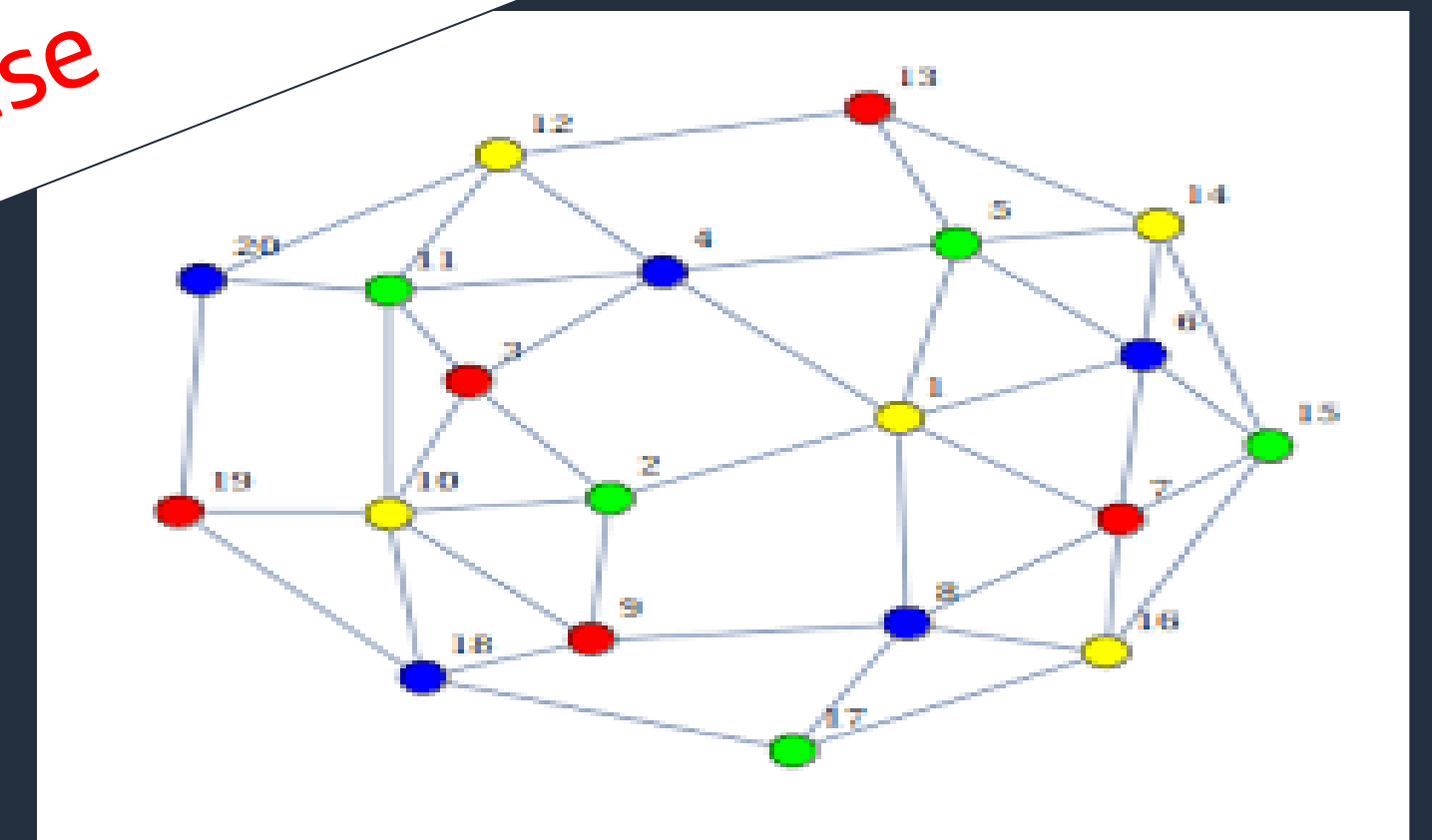
Material Science



High-T superconductivity

~70 qubits

Optimization



Search, ranking, learning

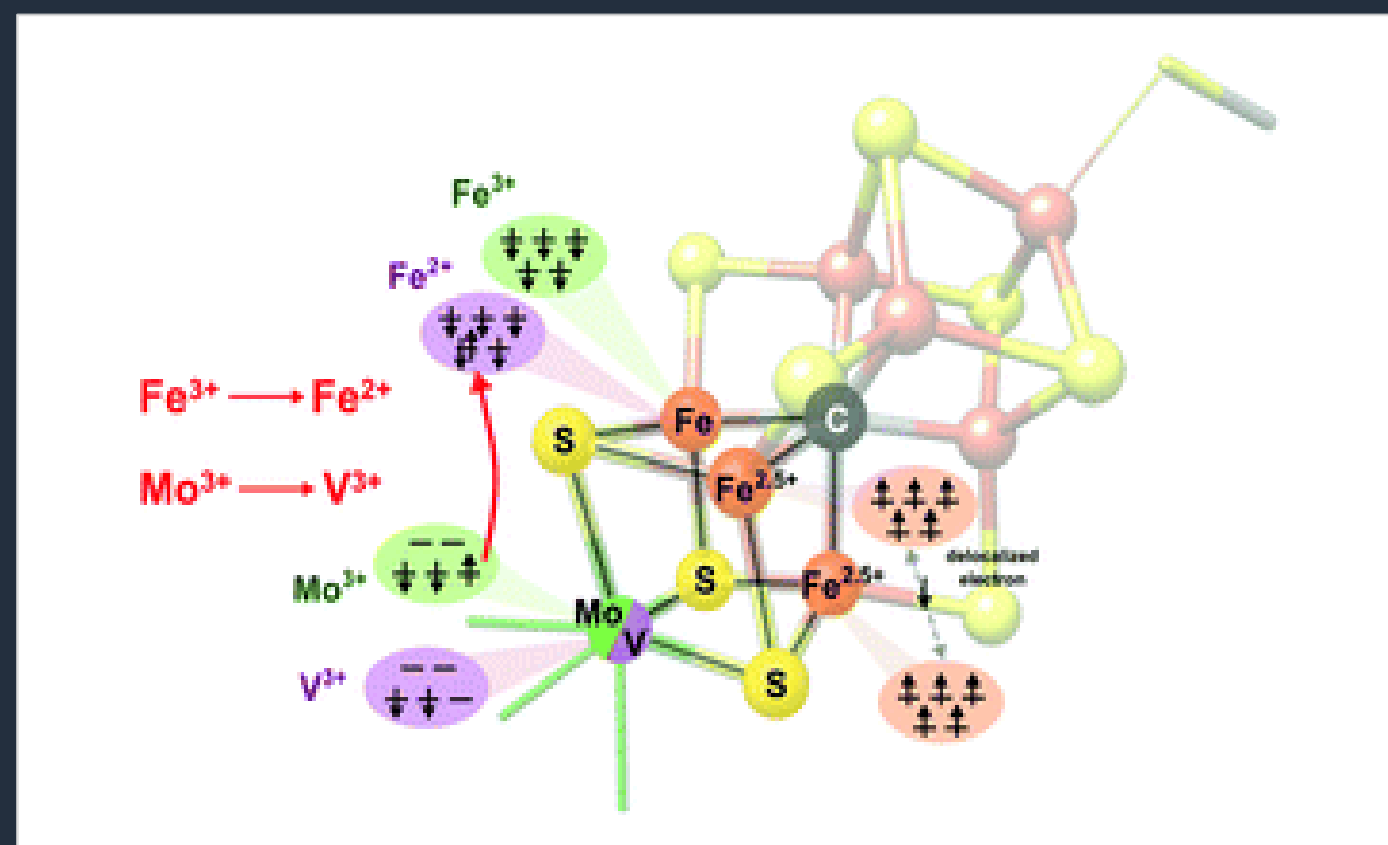
~100 qubits

Only for perfect qubits with no noise

What are potential applications?

Quantum computing is tailored for **low throughput/high complexity problems**

Computational Chemistry



Nitrogen fixation

~ 200k qubits

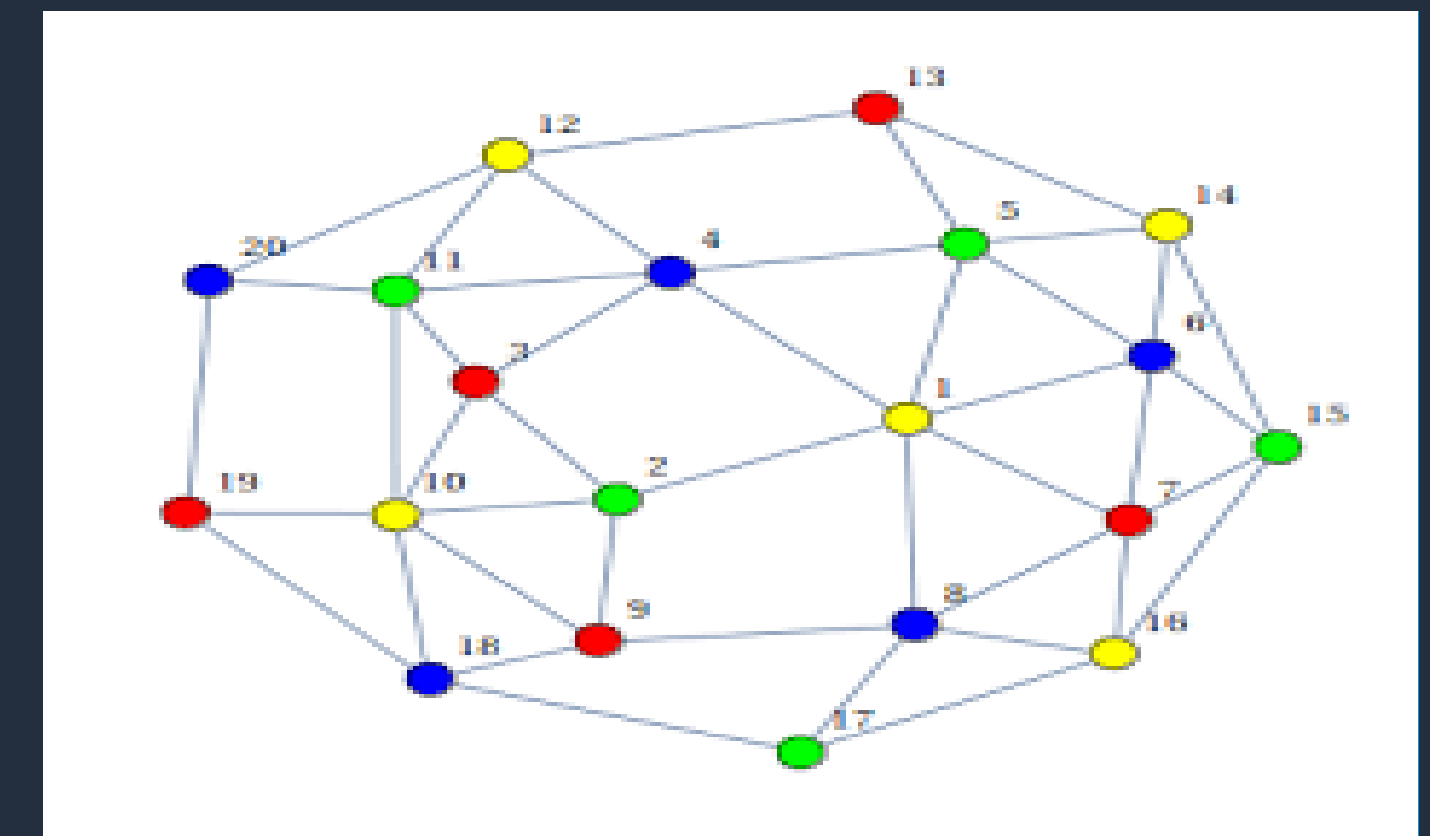
Material Science



High-T superconductivity

~ 100k qubits

Optimization

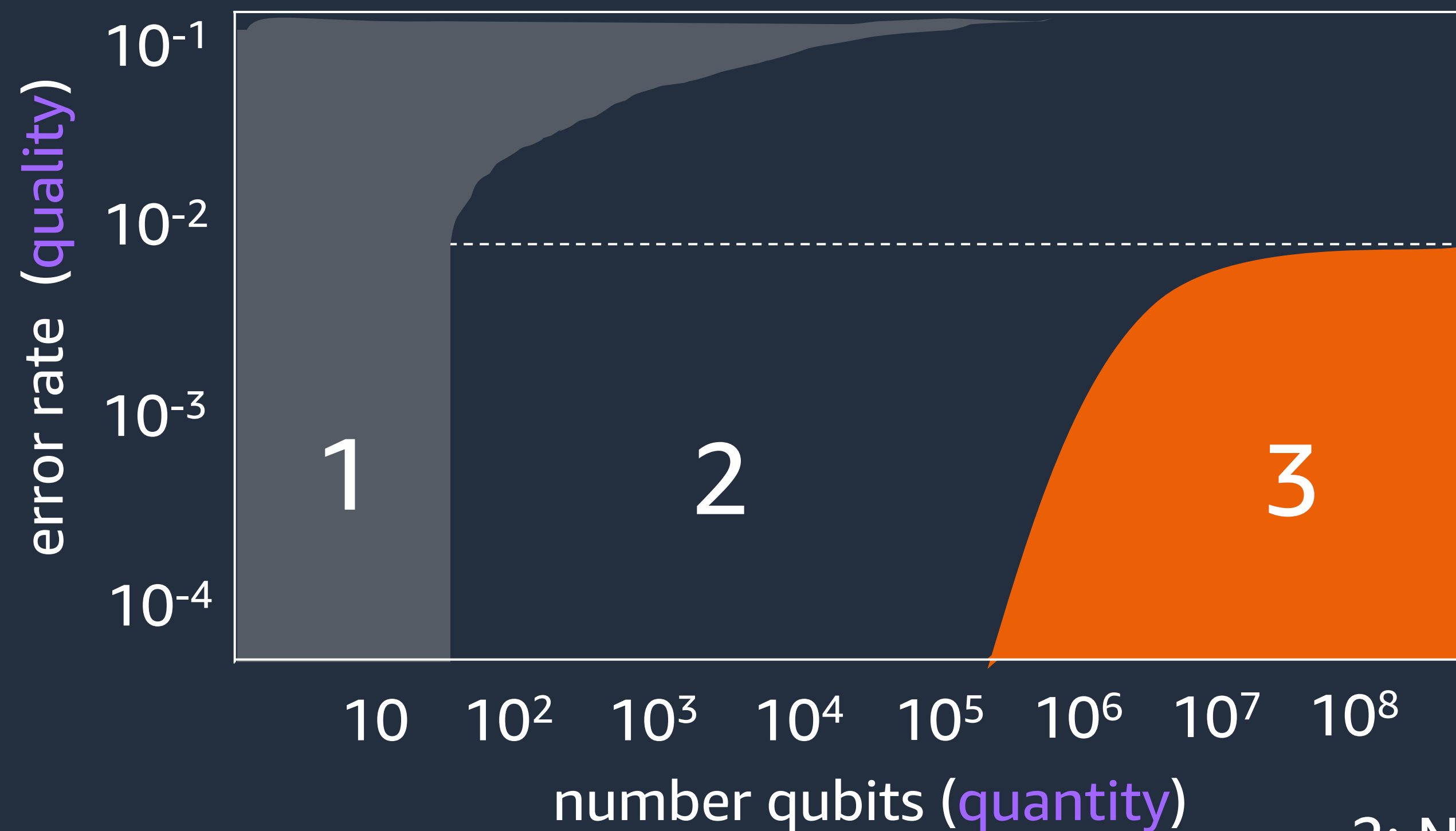


Search, ranking, learning

~ 500k qubits

*at 0.1% error rate

Quantum computing eras

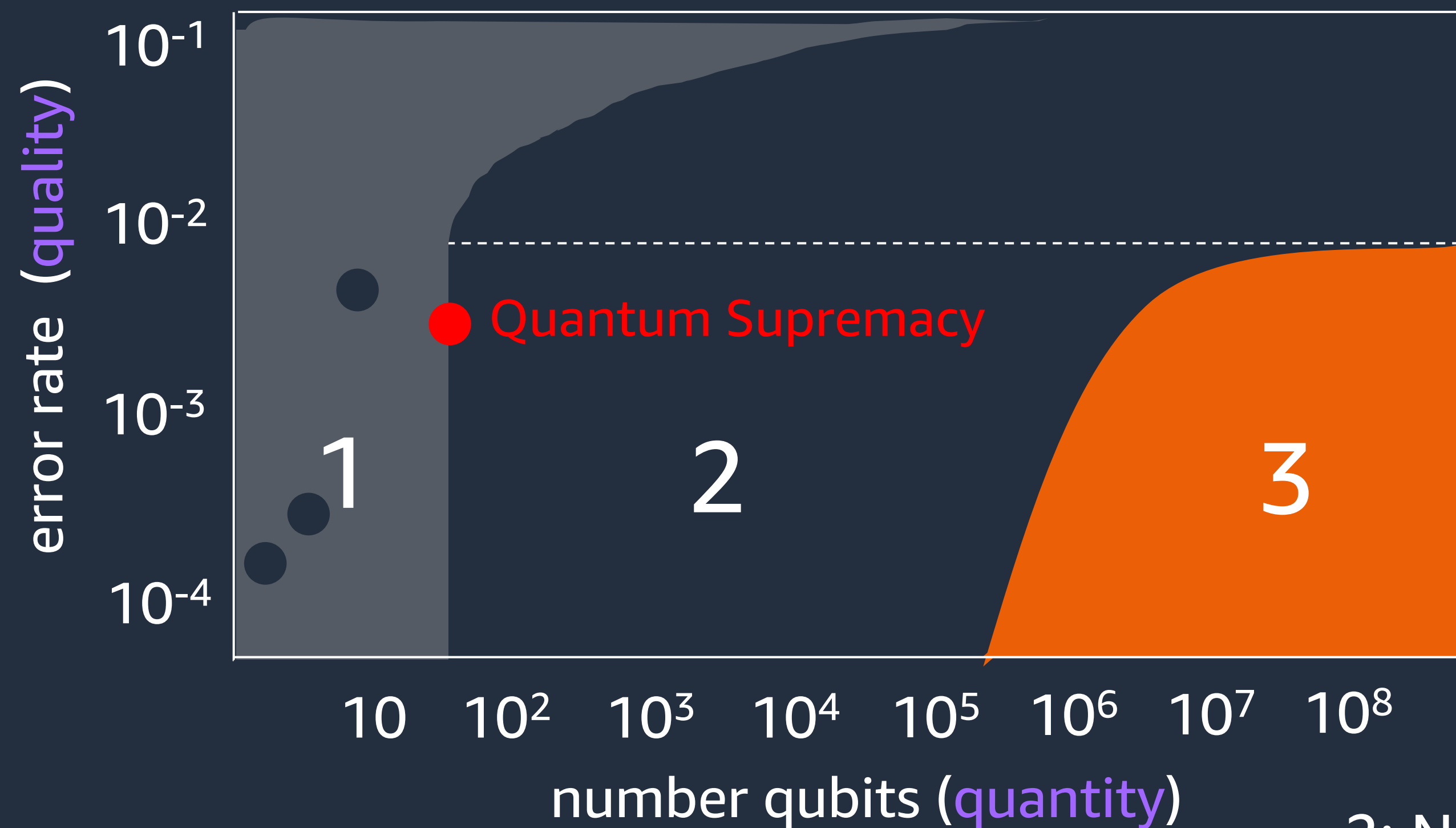


1: Classically simulatable

2: Noisy Intermediate-Scale Quantum (NISQ)

3: Quantum Computing with error correction

Quantum computing eras

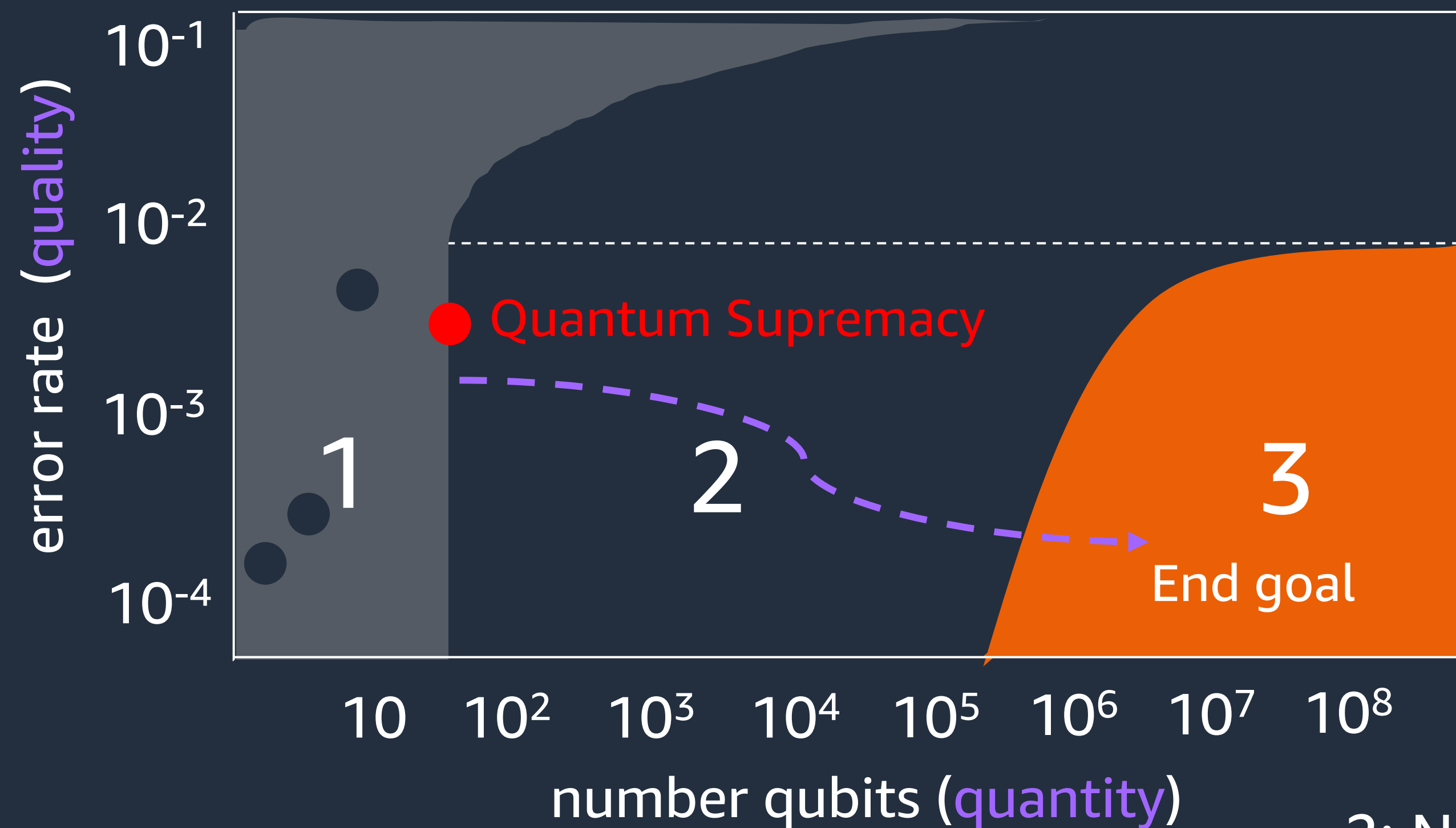


1: Classically simulatable

2: Noisy Intermediate-Scale Quantum (NISQ)

3: Quantum Computing with error correction

Quantum computing eras



more qubits

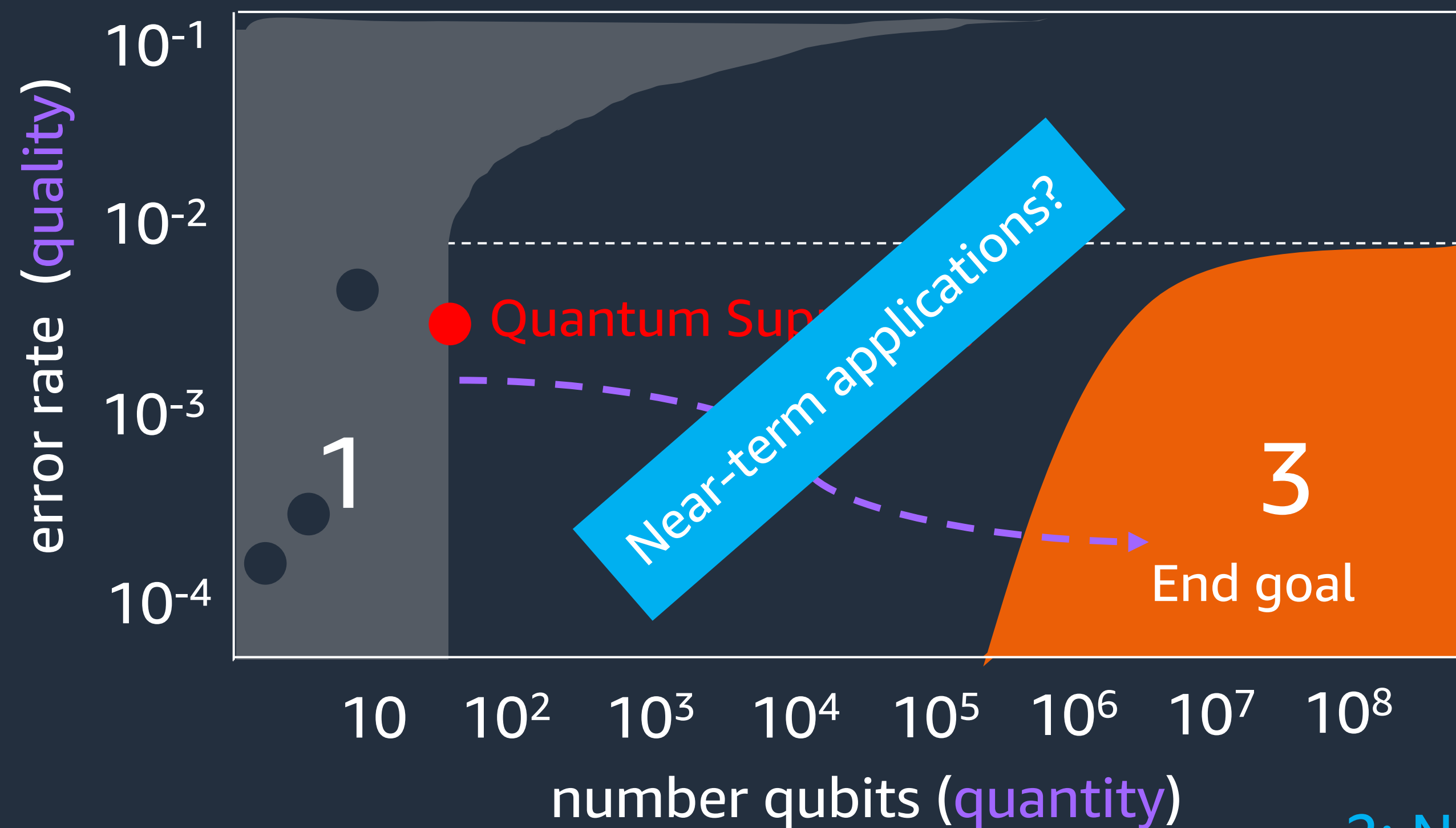
better qubits

1: Classically simulatable

2: Noisy Intermediate-Scale Quantum (NISQ)

3: Quantum Computing with error correction

Quantum computing eras



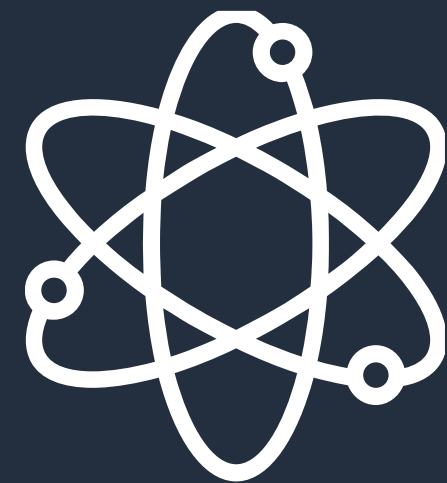
1: Classically simulatable

2: Noisy Intermediate-Scale Quantum (NISQ)

3: Quantum Computing with error correction

Quantum Computing at AWS

AWS Center for Quantum Computing



Push the Boundaries

Original research on quantum algorithms and Hardware

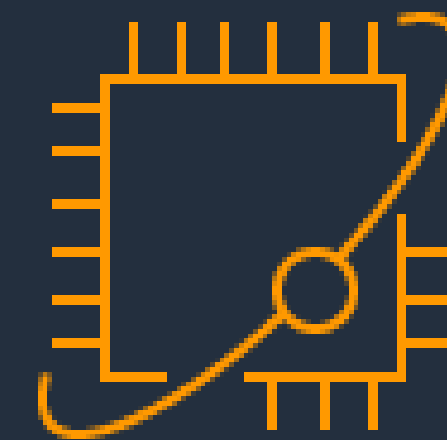
Amazon Quantum Solutions Lab



Get Expert Help

Research collaborations with the Amazon Quantum Solutions Lab

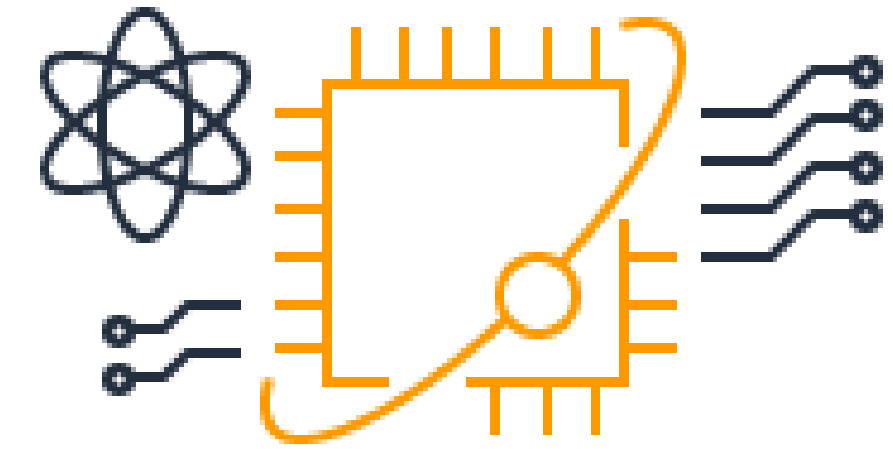
Amazon Braket



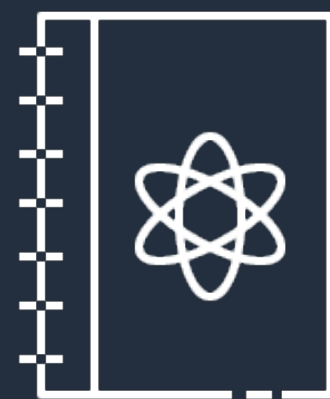
Democratize Quantum Computing

A fully managed service that makes it easy to explore and experiment with quantum computing

Amazon Braket

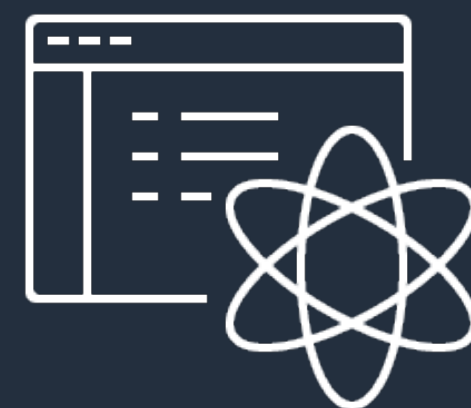


A fully-managed service that makes it easy for scientists and developers to explore and experiment with quantum computing



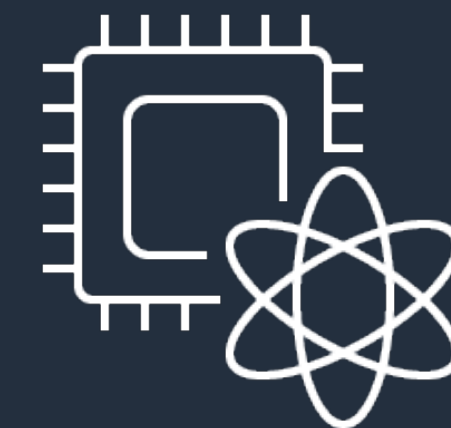
Design

Fully managed development environments



Test

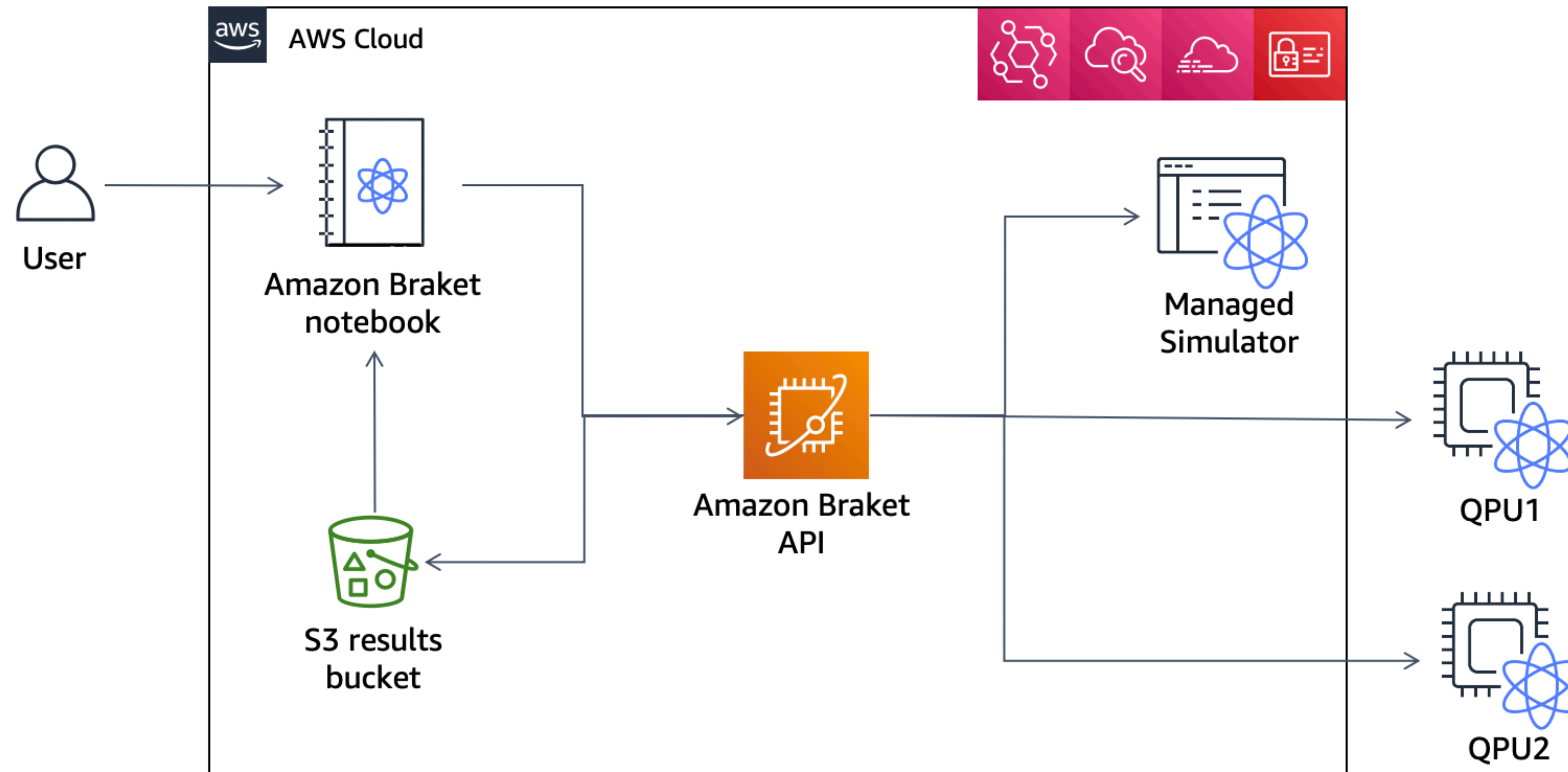
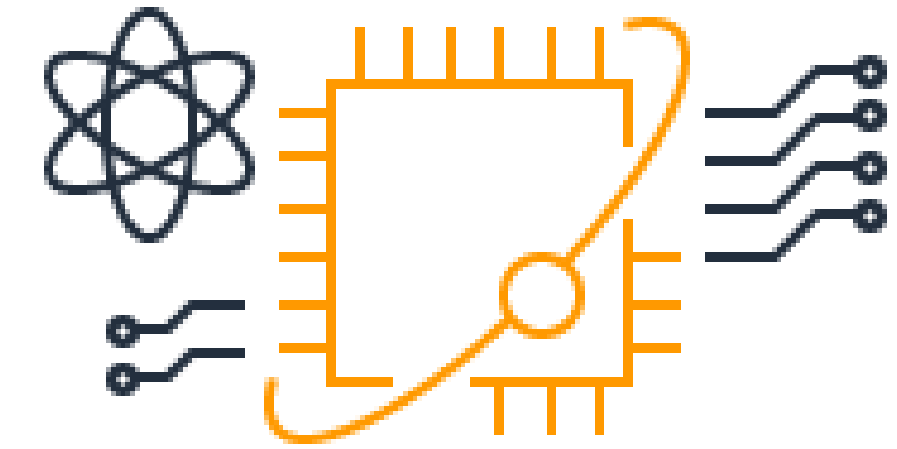
Local and high-performance managed simulators



Run

On-demand access to a range of quantum hardware

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Managed Jupyter environments

Switch devices with one line of code

Data persistence in your account

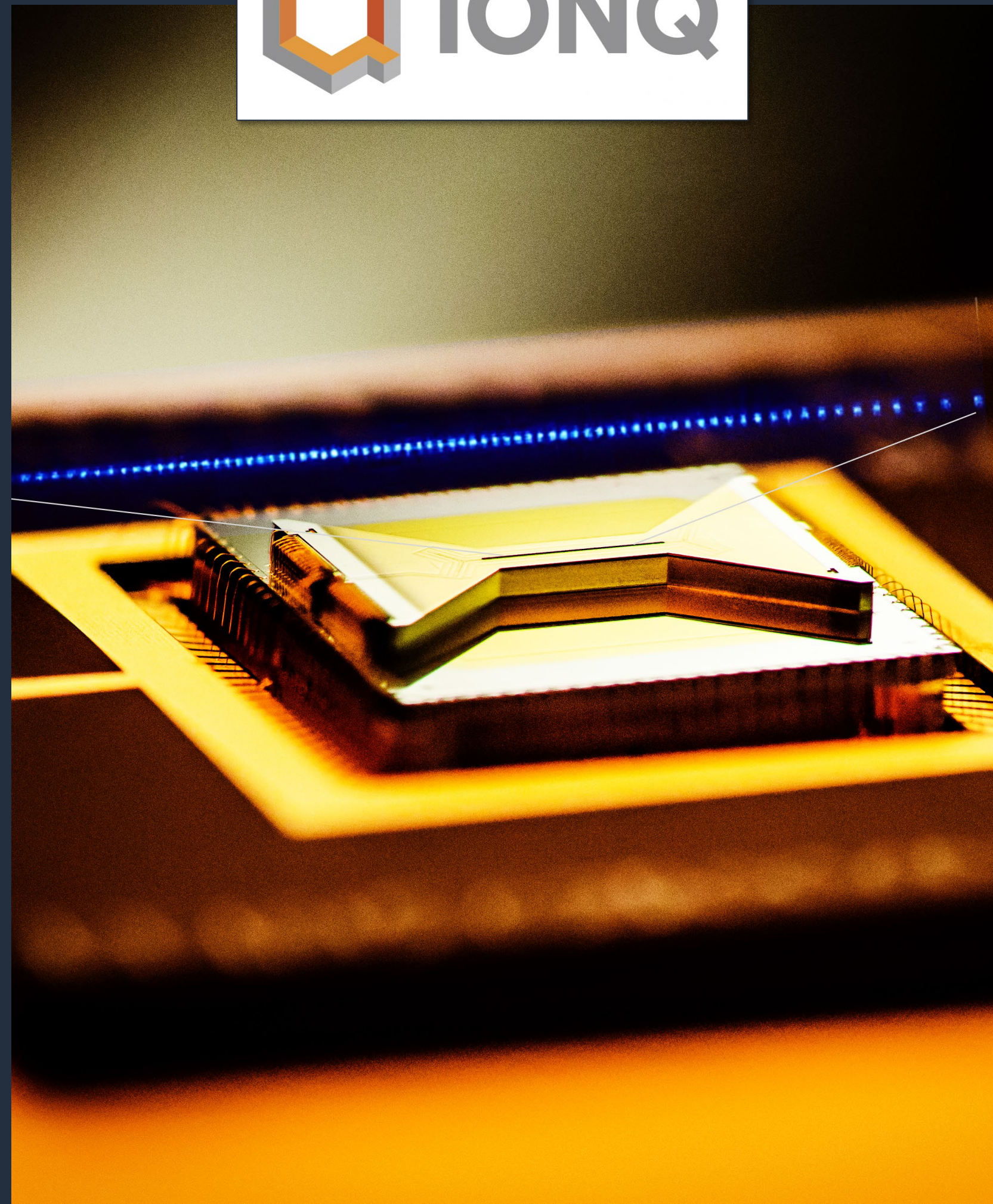
Full AWS integration for monitoring, access management and security

Amazon Braket provides secure, on-demand access to different quantum computers

D:wave
The Quantum Computing Company™



 **IONQ**

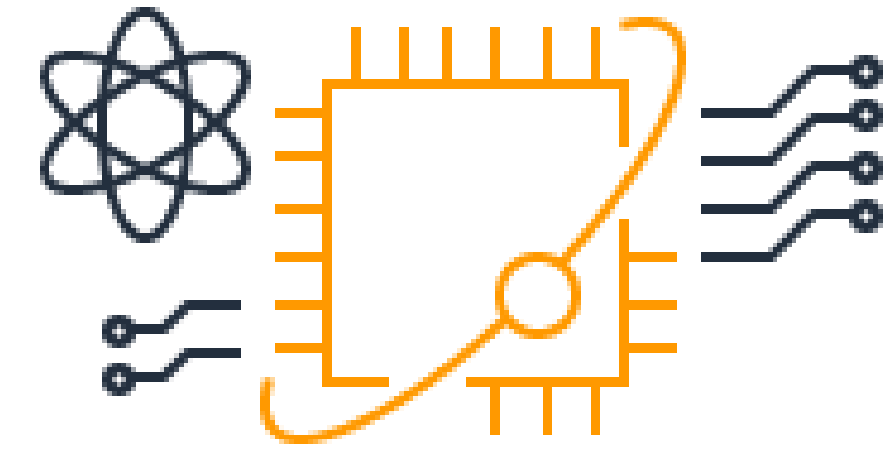


rigetti



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Amazon Braket - Regions



Region availability of Amazon Braket

Region Name	Region	Braket Endpoint	QPU
US East (N. Virginia)	us-east-1	braket.us-east-1.amazonaws.com	IonQ
US West (N. California)	us-west-1	braket.us-west-1.amazonaws.com	Rigetti
US West (Oregon)	us-west-2	braket.us-west-2.amazonaws.com	D-Wave

Amazon Braket SDK

