

IBM Quantum Computing

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IBM Quantum

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Quantum Ambassador

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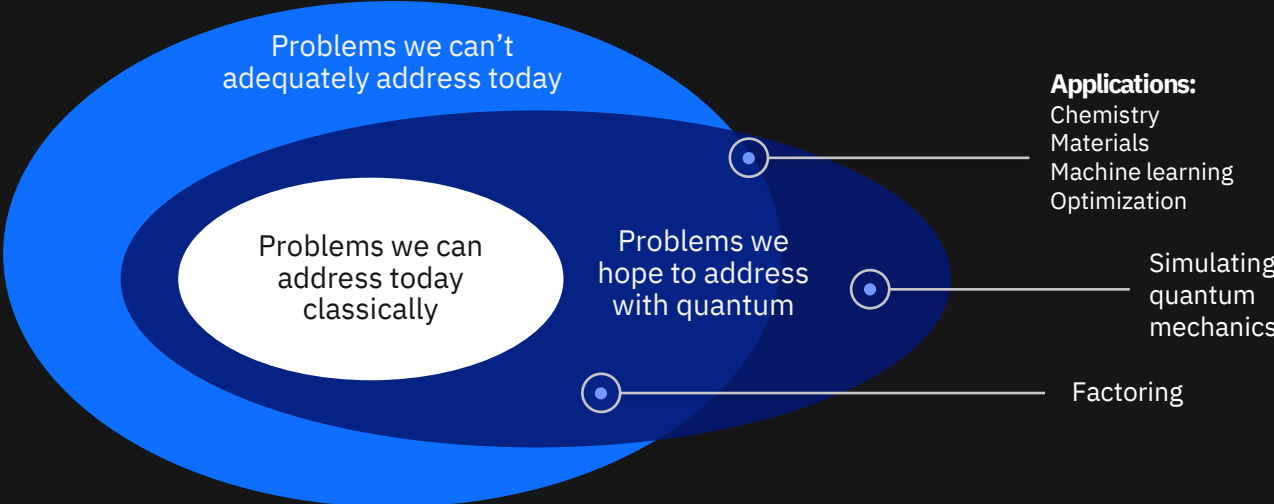
IBM Quantum



Our mission

Bring useful quantum
computing to the world

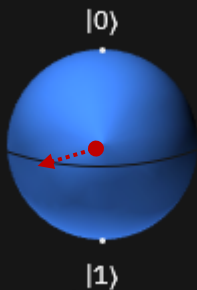
Make the world
quantum safe



Quantum computing uses essential ideas from quantum mechanics

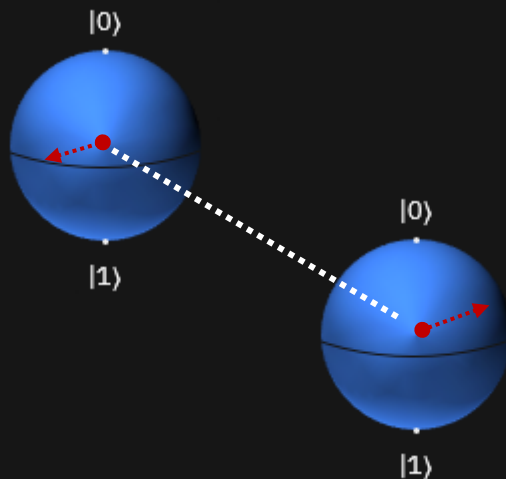
Superposition

Store vast amounts of data compared to regular bits



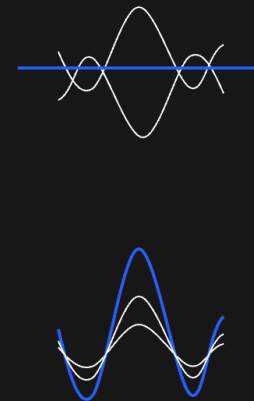
Entanglement

Exponential increase in potential compute power



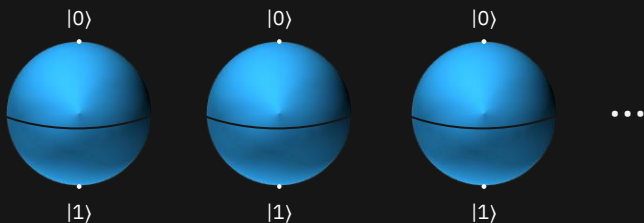
Interference

Solutions can be found more efficiently



Exponential growth

$$2^n$$



n qubits – 2^n quantum state dimensions.

$$2^1 = 2$$

$$2^2 = 4$$

$$2^3 = 8$$

$$\vdots$$

$$2^{10} = 1,024$$

$$2^{20} = 1,048,576$$

$$\vdots$$

$$2^{127} = 1.7 \times 10^{38}$$

Number of qubits available in 2021

$$2^{275} = 10^{82}$$

Number of atoms in the universe

$$2^{433} = 10^{130}$$



Number of qubits available in 2022





IBM Quantum – On the cloud since May 2016

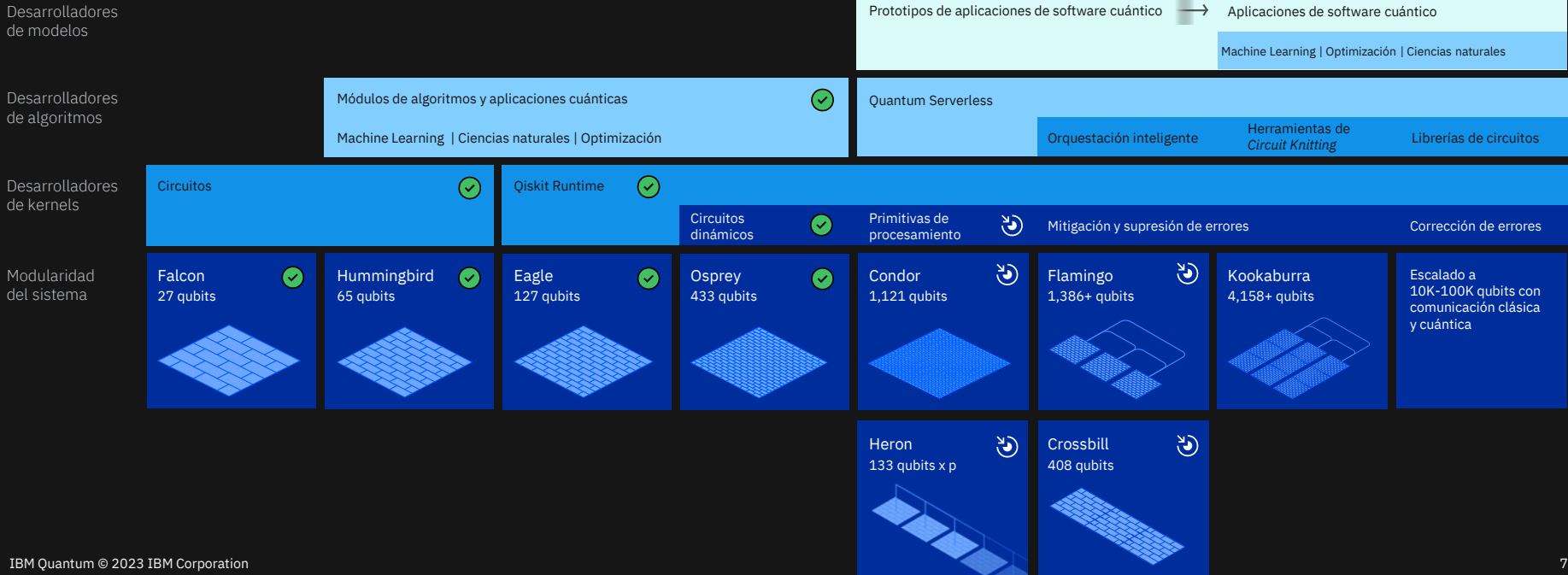
Over 460,000 registered users have run ...
over 2 TRILLION hardware quantum circuits
in total, and users run ...
over 4 BILLION hardware quantum circuits
on a typical day on ...
more than 25 quantum computing systems
on the IBM Cloud, and written over
1750+ scientific and research papers.



Hoja de ruta de desarrollo

Conseguido por IBM 
Objetivo planificado 

2019 	2020 	2021 	2022 	2023	2024	2025	Más allá de 2026
Ejecución de circuitos cuánticos en IBM cloud	Demostración y prototipado de algoritmos y aplicaciones cuánticas	Ejecución de programas cuánticos 100 veces más rápido con Qiskit Runtime	Incorporación de circuitos dinámicos a Qiskit Runtime para incrementar el número de operaciones	Mejora de aplicaciones con computación elástica y paralelización de Qiskit Runtime	Mejora de la precisión de Qiskit Runtime con mitigación de errores escalable	Escalado de aplicaciones cuánticas con herramientas de <i>Circuit Knitting</i> controlando Qiskit Runtime	Incremento de precisión y velocidad de flujos de trabajo cuánticos con integración de corrección de errores dentro de Qiskit Runtime



Quantum applications span three general areas

Simulating Quantum Systems

Improved battery materials
 Manufacturing defect identification
 Semiconductor materials
 Chemical property prediction
 Drug Discovery
 Protein Structure Predictions
 Disease Risk Predictions

Accelerated Diagnosis
 Genomic Analysis
 Chemical product design
 Catalyst discovery
 Chemical process optimization
 High energy physics classification
 Transaction classification
 Product recommendation

Artificial Intelligence

Fraud detection
 Risk analysis
 Options pricing
 Derivatives Pricing
 Investment Risk Analysis
 Portfolio Management
 Transaction Settlement
 Finance Offer Recommender
 Credit/Asset Scoring
 Airline Scheduling

Optimization / Monte Carlo

Irregular Operations
 Network Optimization
 Product Portfolio Optimization
 Process Planning
 Quality Control
 Vehicle Routing
 Raw materials shipping
 Refining Processes
 Seismic imaging
 Disruption Management

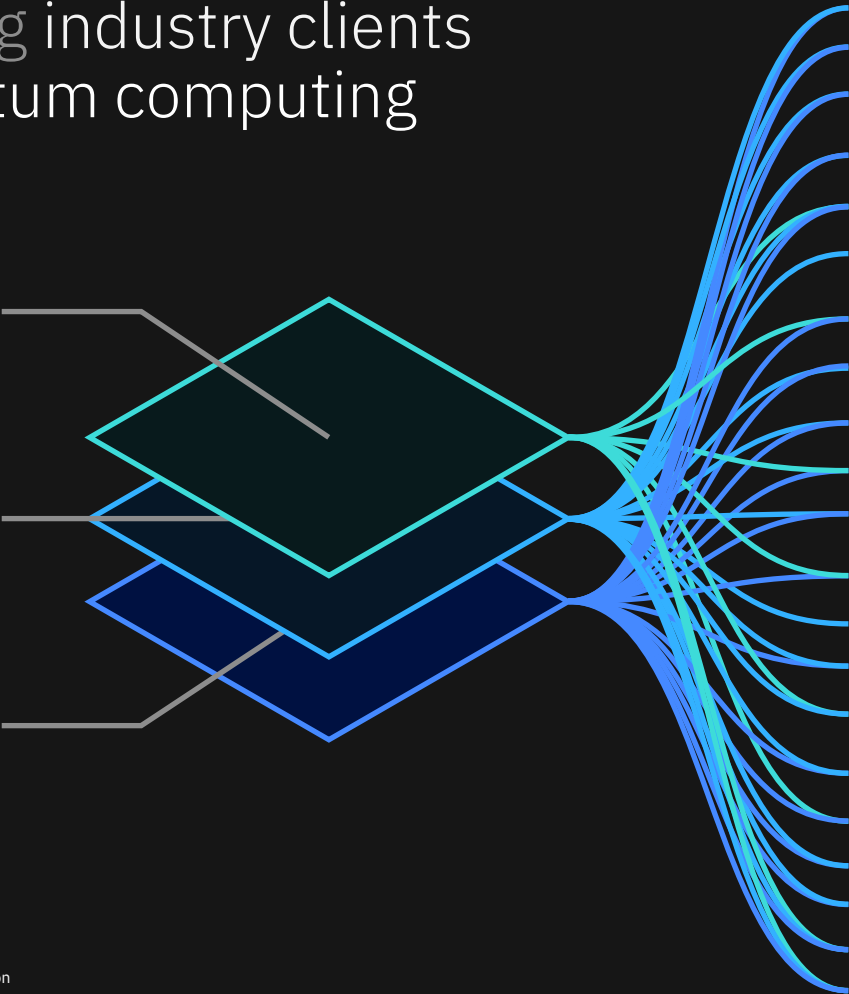
Freight Forecasting
 Irregular Operations
 Fabrication Optimization
 Manufacturing Supply Chain
 Fluid Dynamics
 and many more ...

Connecting industry clients with quantum computing use cases

Simulating nature

Mathematics and processing data with complex structure

Search and optimization



Crédit Mutuel

TEL

ERSTE Bank

vodafone

BOSCH

HSBC

JSR

Goldman Sachs

Woodside Energy

BOEING

JPMORGAN CHASE & CO.

bp

A leading insurance company

e-on

ExxonMobil

WELLS FARGO

A Leading Global Technology & Services Company

AMGEN

A Leading Global Consumer Products Company

SAMSUNG

LG

IBM Quantum Computation Centers (QCC)

IBM Quantum

Centers with dedicated Quantum Systems committed to advancing industry-specific initiatives or regional quantum ecosystems

IBM Quantum
datacenter in NY

Fraunhofer
Dec 2020

University of Tokyo
Jun 2021

Cleveland Clinic
Mar 2023

PINQ²
Projected 2023

Yonsei
Projected 2023

BasQ
Projected 2024



New York, USA



Ehningen, Germany



IBM Quantum
System One
Shin-Kawasaki,
Japan



Ohio, USA



IBM Quantum
System One
Bromont, Canada



IBM Quantum
System One
Seoul, South Korea



IBM Quantum
System One
Basque Country, Spain