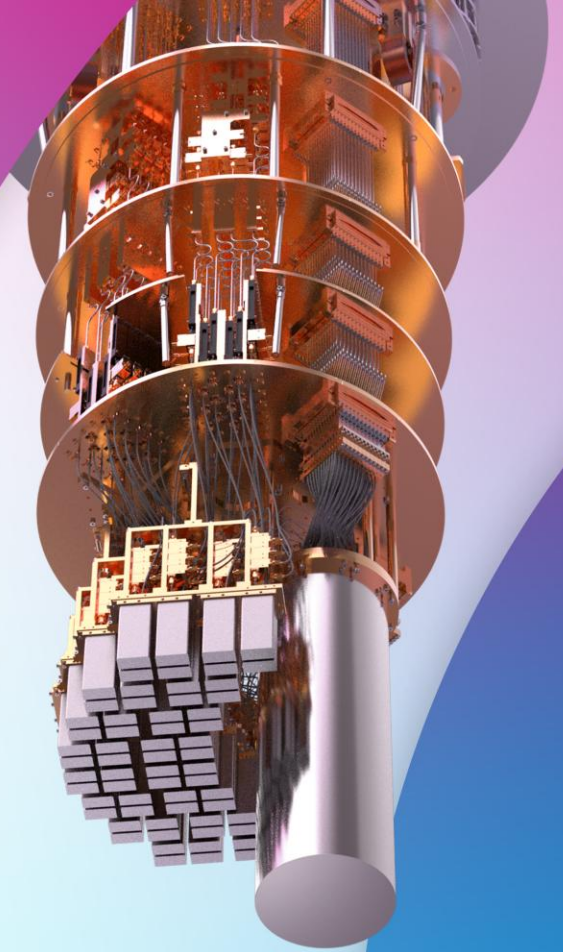
ISC High Performance 2026

Quantum Computing



Fujitsu Limited

June, 2026

Evolution toward Next-Generation Computing

FUJITSU

2023

NISQ
Accelerating the development of quantum applications

2030

Early-FTQC
Realizing practical quantum computing (※)

2040

FTQC
Unleashing the true potential of quantum computers

※In some areas where supercomputers are not practically able to solve problems

Computation scale: high

Drug discovery
Material
Finance
Quantum for AI
CAE/CFD

Practical quantum computation

Quantum computing


64 qubits


Quantum simulator


256 qubits

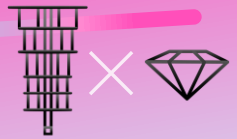

1,024 qubits

Diamond spin


STAR Architecture


10,000+ qubits
(250 logical qubits)

1,000 logical qubits


Evolving through the integration of different technologies

Integrated HPC - AI - Quantum Computing

Quantum-inspired computing / AI


Digital Annealer
Service-in

Conventional Computing


HPC
FX1000


Processor
A64FX


Processor
FUJITSU-MONAKA
2nm


Processor
FUJITSU-MONAKA-X
1.4nm


Processor
FUJITSU-MONAKA-XX
cutting edge process node

Fujitsu's Strategy for Quantum Computing

FUJITSU

- Cover all the technology layers with the world's leading research institutions
- Put emphasis on software technologies, while working on several types of hardware
- Develop applications with end users by using Hybrid Quantum Computing Platform

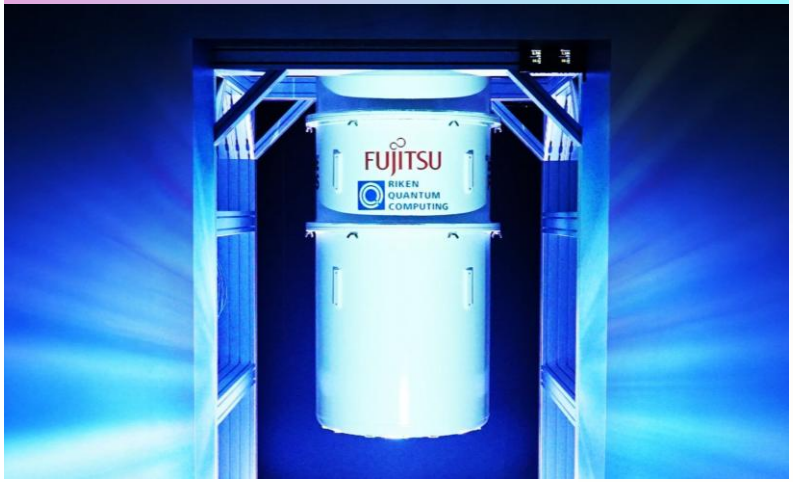
Quantum Application	Research with end-user input: **Materials** | **Drug discovery** | **Finance**		**FUJIFILM, Tokyo Electron, TU Delft,** etc.
Quantum Software	Algorithm	**UC Berkeley** Quantum error correction	**U of Osaka** Quantum error correction
Quantum Platform	Complier Middleware	**U of Edinburgh** Hybrid computing	Cloud technology
Quantum State Control Quantum Device & Integration	**RIKEN** Superconducting qubit	**TU Delft** Diamond spin qubit	Exploring other possibilities, Neutral atom etc.

Launch of a 64/256-qubit Superconducting Quantum Computers

Developed at RIKEN RQC-Fujitsu Collaboration Center with Prof. Nakamura

64-qubit system

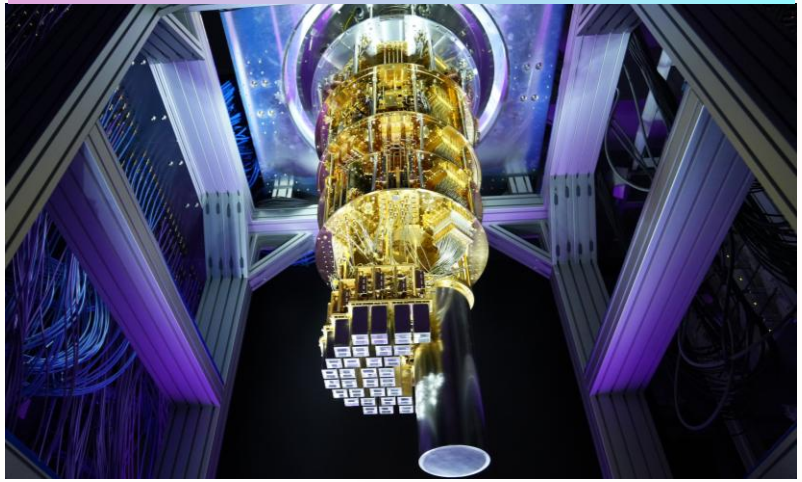
Oct. 2023



https://pr.fujitsu.com/jp/news/2023/10/5.html

256-qubit system

Apr. 2025



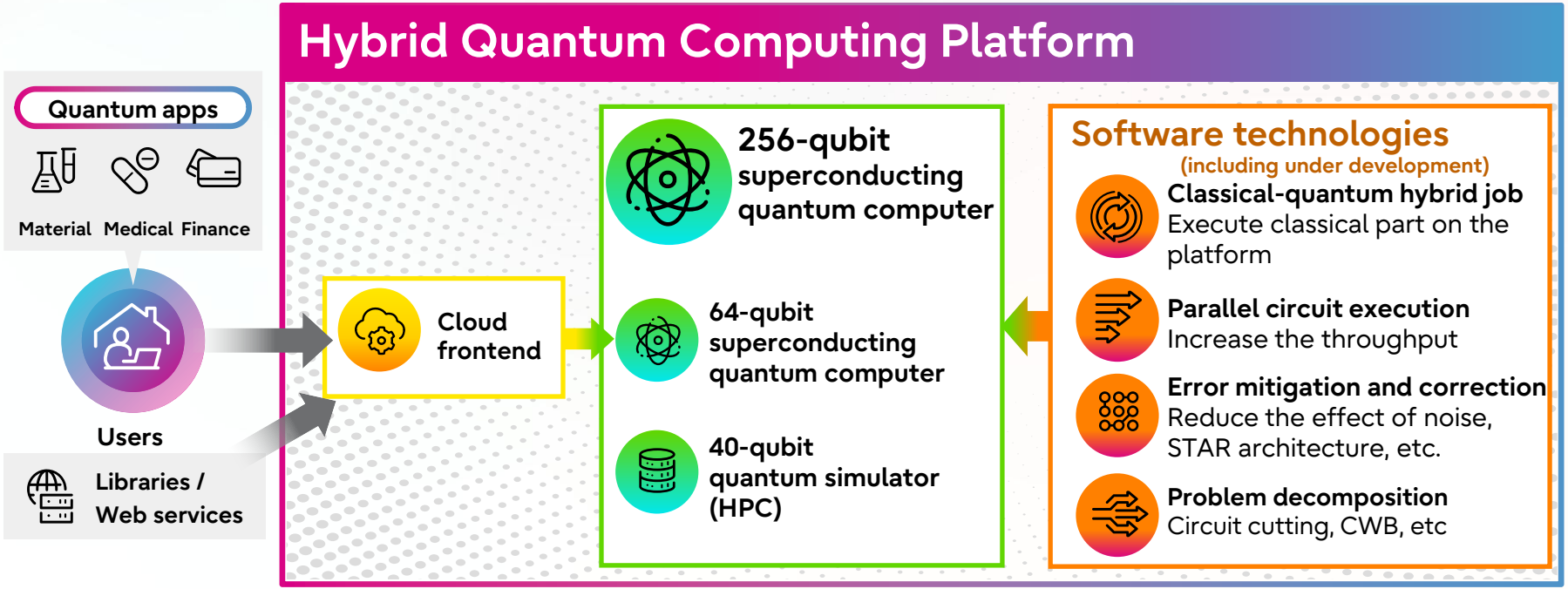
https://pr.fujitsu.com/jp/news/2025/04/22.html

Hybrid Quantum Computing Platform

FUJITSU

Seamless operations between quantum computer and quantum simulator

Developing new software technologies to make the most of the potential of the scaled-up quantum computers



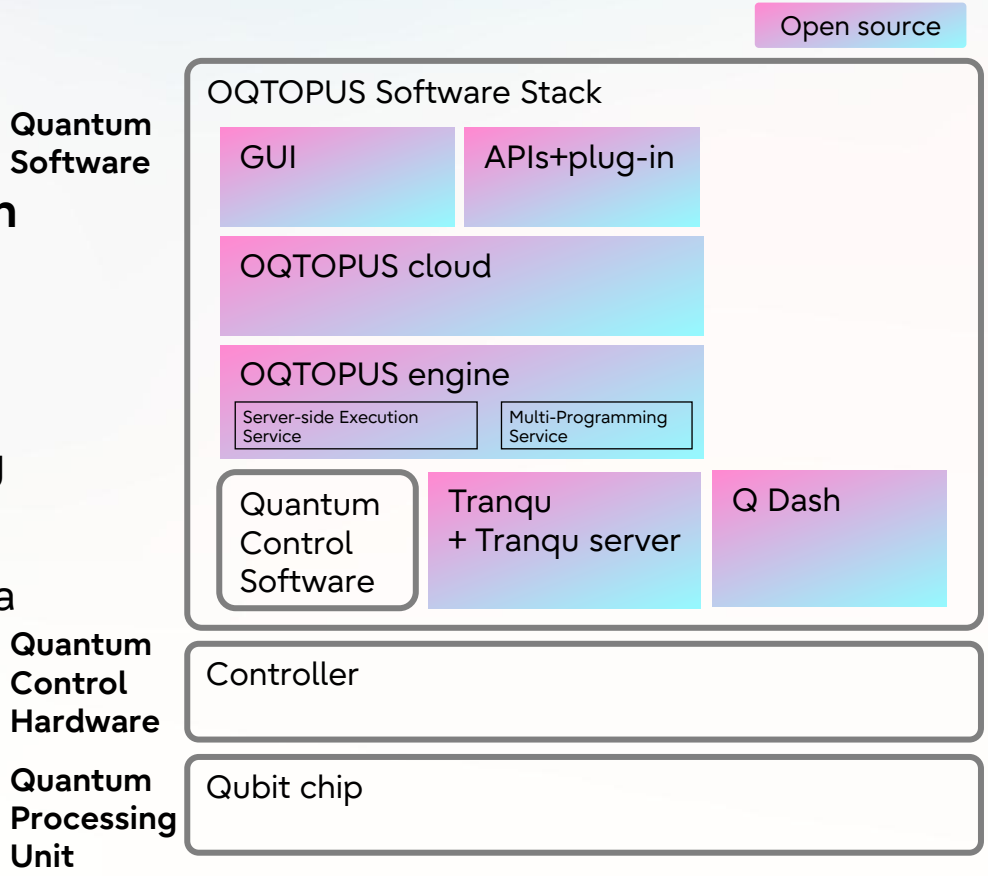
OQTOPUS: Platform software as OSS

大阪大学 THE UNIVERSITY OF OSAKA | FUJITSU

OQTOPUS
Open Quantum Toolchain for OPerators & USers

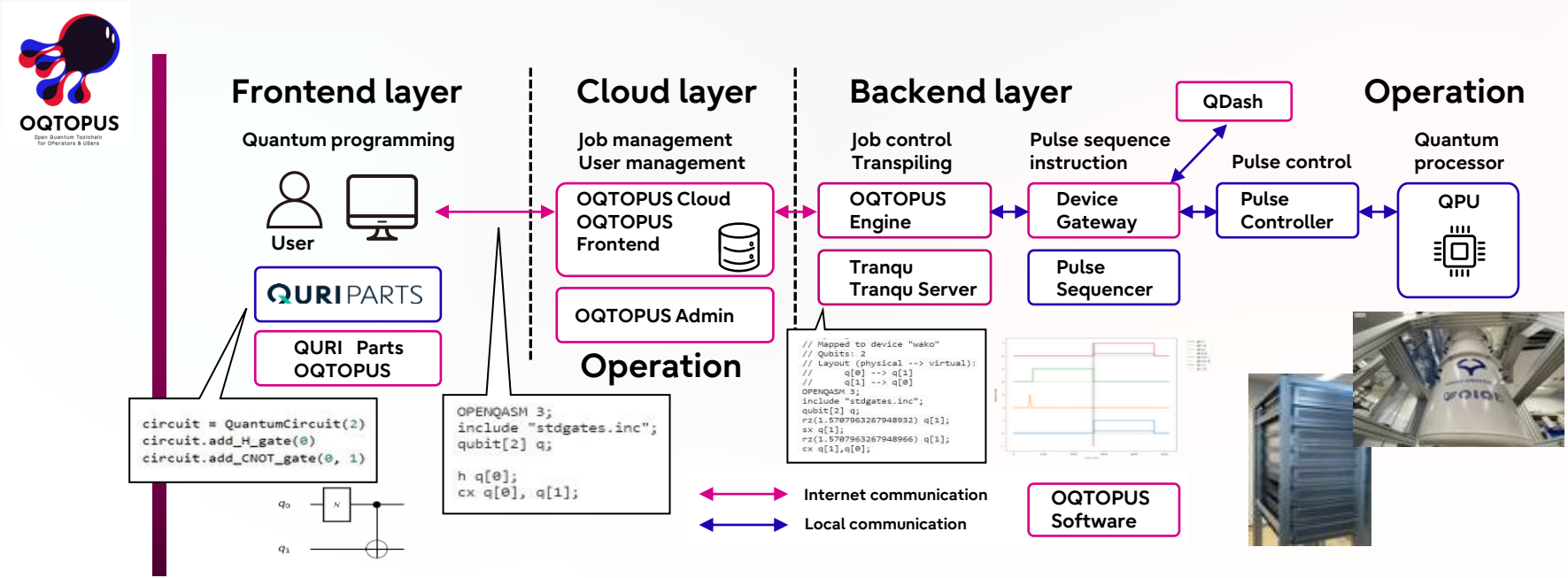
Open Quantum Toolchain for Operators and Users

- Full-stack quantum computing system including discussed features, operating across three layers
- Developed with the University of Osaka
  https://github.com/oqtopus-team



OQTOPUS: Platform software as OSS

Open Quantum Toolchain for Operators and Users



Our First Commercial Quantum Computer

FUJITSU

Delivered to G-QuAT at AIST in March 2025, as part of the ABCI-Q

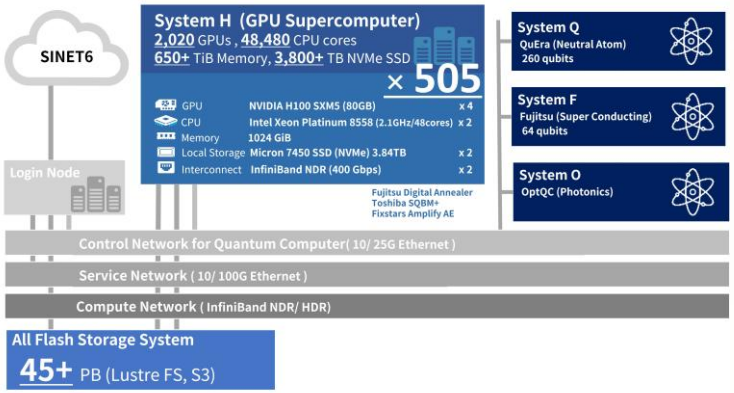
- Planned to be made available to engineers in Japan and internationally to support the social implementation of quantum technologies

ABCI-Q: A quantum classical hybrid computing infrastructure

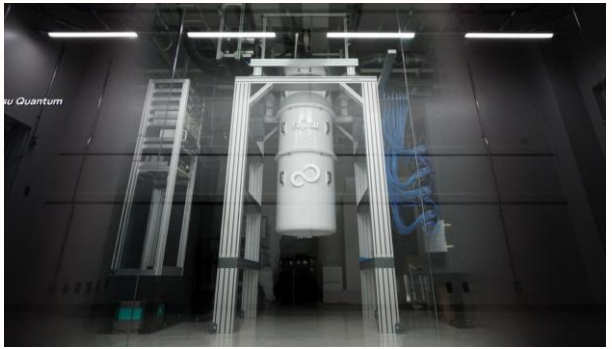
- Comprises a GPU supercomputer and multiple quantum computers of different modality
- Fujitsu provided the GPU supercomputer and a superconducting quantum computer

ABCI-Q : Quantum Classical Hybrid Computing Infrastructure

System H
GPU Supercomputer



System F
Superconducting Quantum Computer by Fujitsu



Illustration/Photo: By courtesy of G-QuAT, AIST

Fujitsu Quantum Computer Roadmap

FUJITSU

FY 2022 | 2023 | 2024 | 2025 | 2026 | 2030 | 2035

March
36 -qubit Simulator

March
Helped RIKEN release first Japanese domestic quantum computer

July
40 -qubit Simulator

October
64 -qubit quantum computer
Developed by RIKEN RQC – Fujitsu Collaboration Centre

August
Establishment of high-speed execution method of practical algorithm using original quantum computing technology STAR architecture

March
256 -qubit quantum computer
Computer with quantum-classical hybrid applications

December
1,024 -qubit quantum computer

10,000+ -qubit (250 logical qubits) quantum computer

1,000 -logical qubit quantum computer

2024
64 qubit machines x HPC hybrid computing

September 2025
Completion of quantum building

December 2026
1,024 -qubit machine ×HPC(**FUJITSU-MONAKA**) Hybrid computing center

2031
10,000+ -qubit machine ×HPC (**MONAKA-X, GPU servers**) Hybrid computing center

Industrial PoC

FUJITSU

Materials

FujiFilm

Discover innovative materials through simulation

Precise energy calculation of organic molecules using Variational Quantum Algorithms

Drug Discovery

Mitsubishi Chemical Corporation

Realize drugs with high efficacy and low side effects

Computing energies of large molecules such as proteins

Finance

Mizuho Daiichi Financial Technology

Optimizing investment decisions

Risk assessment for portfolio optimization with Quantum Monte Carlo

Manufacturing

AGC

Effective resource utilization to reduce environmental impact

Quantum approximate optimization algorithm for glass plate cutting problems

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Diamond spin qubit technology

Diamond nitrogen-vacancy (NV) center

FUJITSU

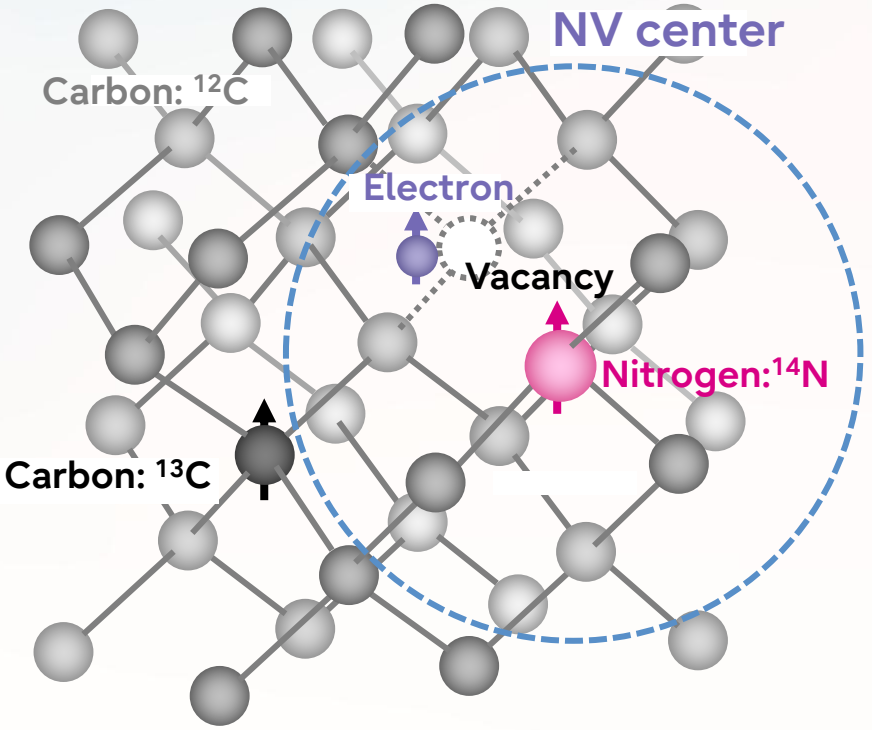
A structure in a diamond crystal where a carbon atom is substituted by a nitrogen atom at its expected lattice site, and there is a vacancy at an adjacent site.

The NV center captures one electron, becoming negatively charged, and exhibits magnetic properties.

Due to the strong bonds of the carbon atoms that constitute diamond, the spin is stable and can maintain a superposition state for a relatively long time.

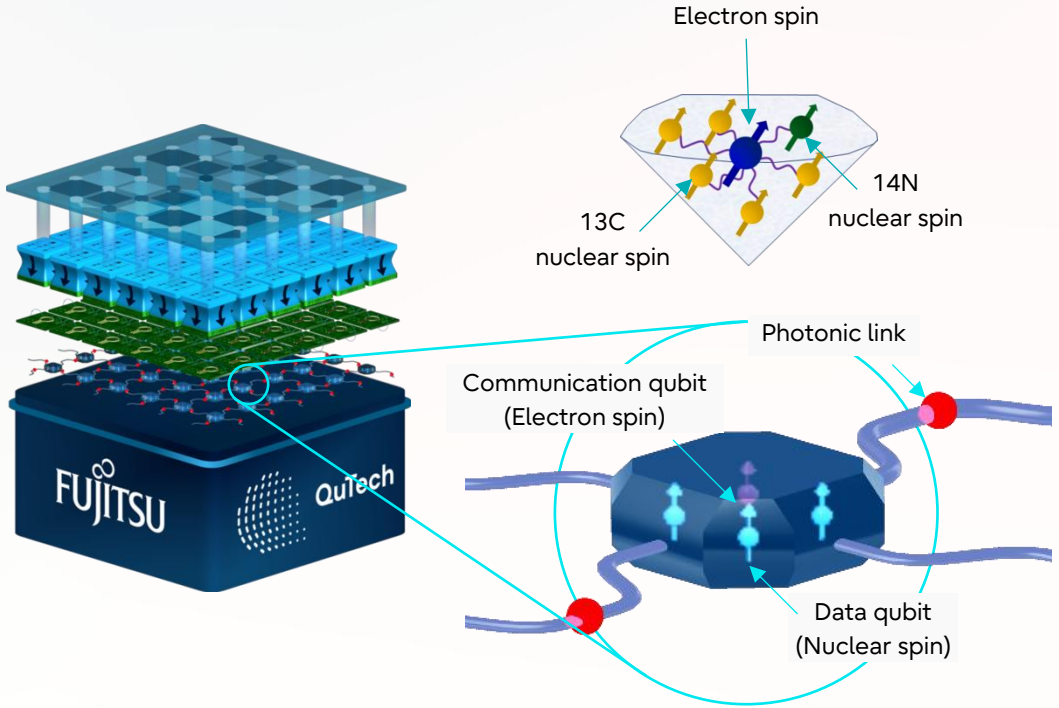
Spin that can be used as a qubit

- **Electron spin around a vacancy**
- **Nuclear spin of an isotopic carbon atom: ^{13}C & ^{14}N**



Diamond-Spin Qubit Technologies for Scalable Quantum Computer

- Each quantum module consists of an electron spin and nuclear spins in a diamond.
- Quantum modules are connected by photonic links, which can be used as one quantum computing system.
- This approach can allow for high-temperature operation (> 1 K) and good scalability.



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Digital Annealer

What is the Digital Annealer?

FUJITSU

A computing technology inspired by quantum phenomena

- Quickly solves “combinatorial optimization problems” using annealing-based algorithms
- Software-based implementation enables rapid deployment in customer environments

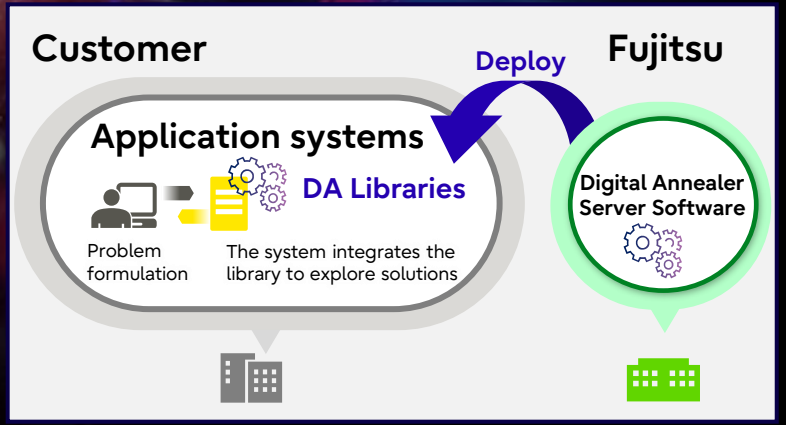
Features

Scalability
Supports 100,000-bit problems
(up to 1 million bits achieved at research level)

High Speed
Incorporates constraint-based search technology into the annealing core to accelerate solving many complex real-world problems

Practical Applications
Over 350 customer implementations

Delivery model



Digital Annealer Application Areas

FUJITSU

Contributing to solving various customer challenges

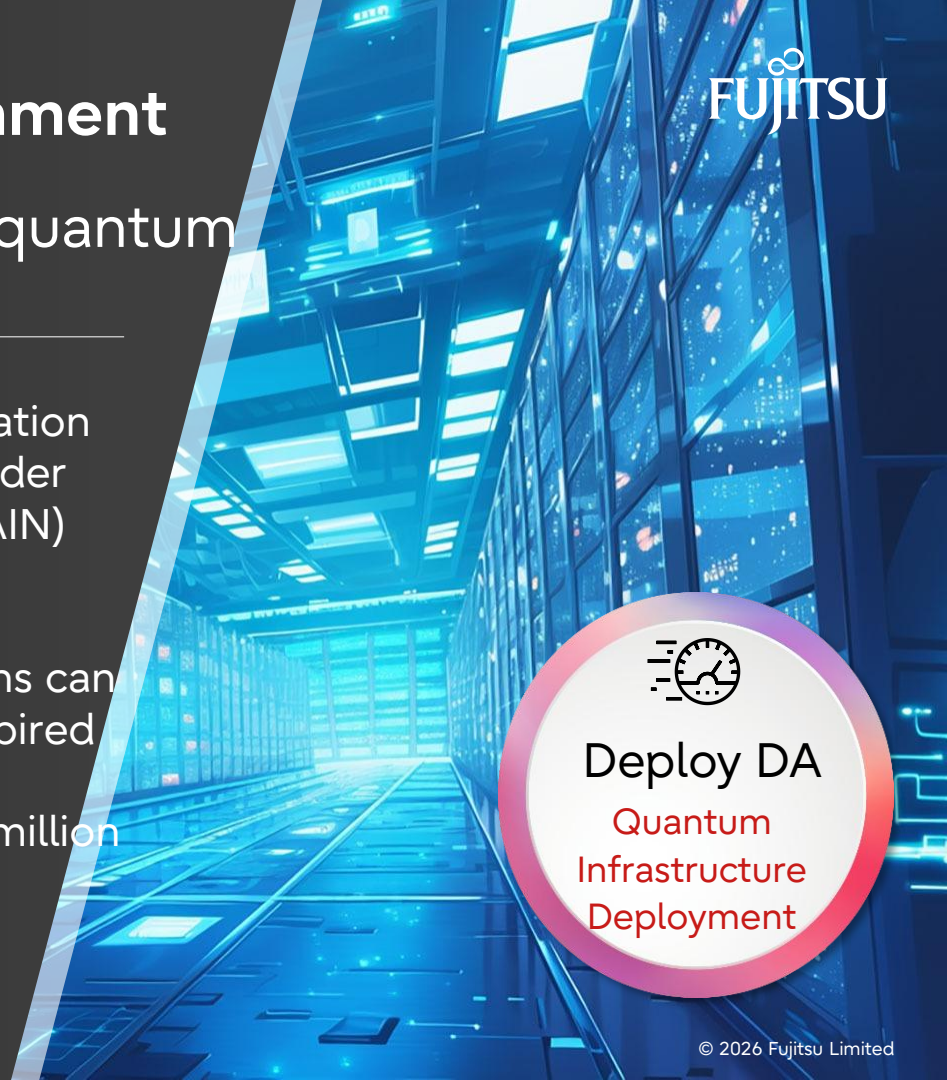
350+ successful projects

Public sector Basque Government

Installation of Digital Annealer in quantum technology infrastructure

- ✓ Led by FSAS Technologies Spain in collaboration with Telefónica and Lantik. Implemented under Bizkaia Quantum Advanced Industries (BIQAIN) public initiative
- ✓ Provides an environment where companies, research institutions, and public organizations can experiment with quantum and quantum-inspired technologies
- ✓ Duration: 5 years, Investment: approx. €3.9 million

Press release: 14th Jan, 2026
https://eu.fsastech.com/nl/about-us/press-releases/fsas-technologies-drives-quantum-technology-in-bizkaia-with-the-installation-of-the-first-digital-annealer-outside-japan/

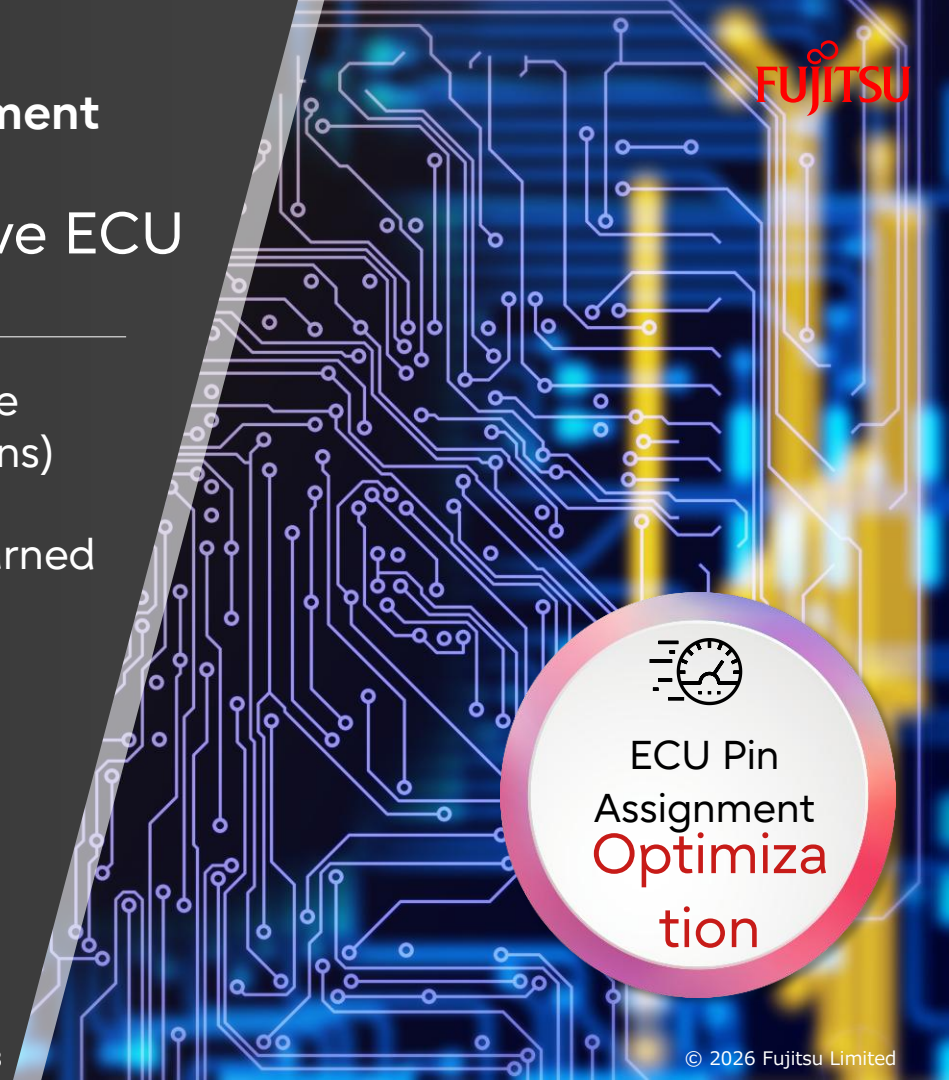


FUJITSU

Manufacturer - Design & Development

Improving efficiency of automotive ECU design

- ✓ Calculates optimal pin layouts from massive combinations (100 pins → 9.3×10^{157} patterns)
- ✓ Achieves over 20× speed improvement vs conventional methods by combining AI-learned expertise and DA computation



Press release: 14th Jan, 2026
https://global.fujitsu/ja-jp/pr/news/2026/01/14-01

Logistics Use Case

Enhance delivery efficiency by optimizing last-mile delivery routes

- ✓ Deployed at 80 distribution centers nationwide to resolve last-mile challenges
- ✓ Reduces driver working hours through route optimization
- ✓ Contributes to environmental impact reduction such as lower CO_2 emissions

Press release: 23rd Jan, 2026
https://www.nitorihd.co.jp/news/items/be646b745964fc695a60d16fb229f480.pdf

Quantum-inspired Technology Digital Annealer

FUJITSU

Continuously advancing quantum computing technologies toward the era of fault-tolerant quantum computing in 2030 and beyond

Quantum Technology

Quantum-inspired Technology

Application Layer

DA Server S/W
- Software that enables on-premises DA system deployment

EvoQX S/W
- Auto-generates QUBO using Digital Annealer + ML
- Enables easy use without specialized expertise

DA for Route Planning S/W
- Software that leverages the Digital Annealer for solving vehicle routing problems (VRP)

Conversational optimization
- Chat-based tool to formulate, solve, and visualize optimization problems
- Powered by GenAI for easy interaction and use

2020-2024	2025	2026	2027	2028-2029	2030 -

DA Core Engine

3rd Gen in 2020
- 100k-bit support via hardware-software hybrid

4th Gen in 2022
- Large-scale annealing core
- Up to 10× faster than 3rd Gen

5th Generation
- Higher-order term support
- Quadratic inequality constraint support
- Accelerated linear problem solving

5th+ Generation
- Support for integer and real variables
- Ultra large-scale problems support

Hybrid Computing
- Combining quantum computing strengths with Digital Annealer–based optimization

*Roadmap is subject to change without notice.

Conversational Optimization *Under development

FUJITSU

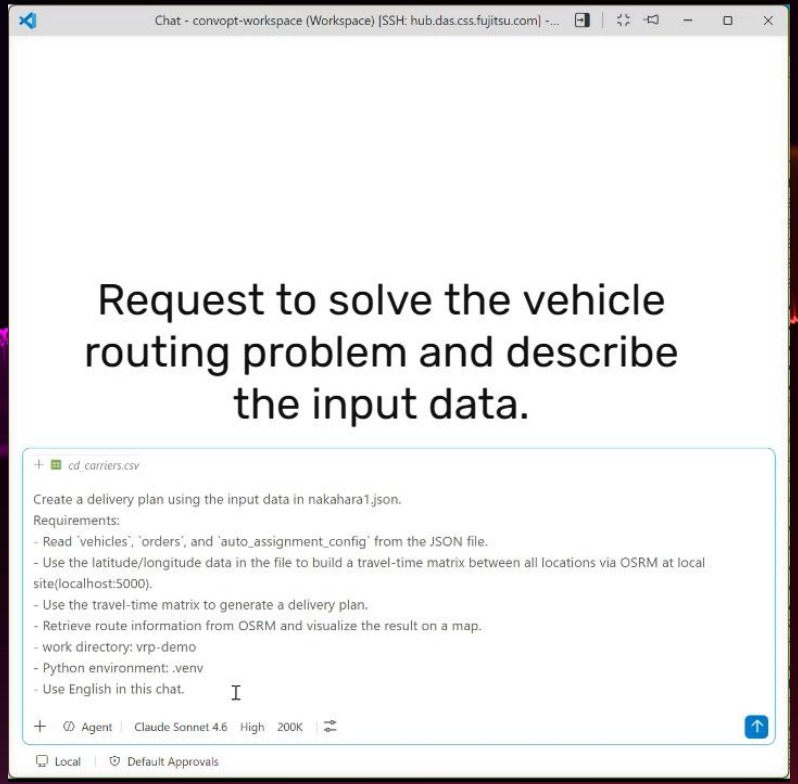
Challenge

Solving business problems requiring optimization needs experts with formulation knowledge and time

Value provided

Achieves rapid solutions to combinatorial optimization problems via a conversational interface

- Automatic formulation in a short time
- Enter requirements via chat → optimization problem automatically formulated
- Digital Annealer solves it at high speed
- Example:
  Reduces factory workforce planning formulation from one month to one day



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Thank you