

Quantum Computing at Fujitsu

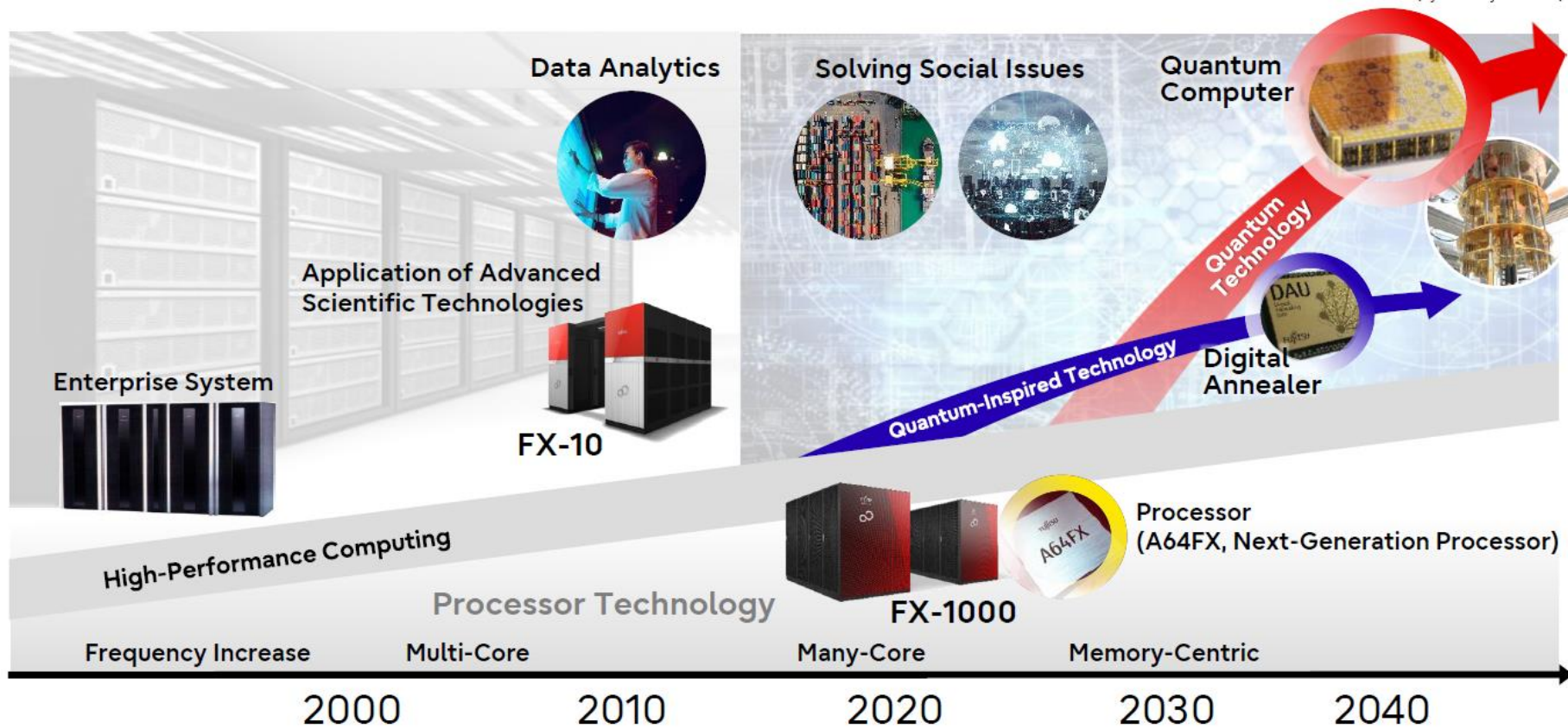
Fujitsu Platform Business Spain



Juan Antonio García
Senior Platform Business Solutions Engineer
FUJITSU BLP Spain

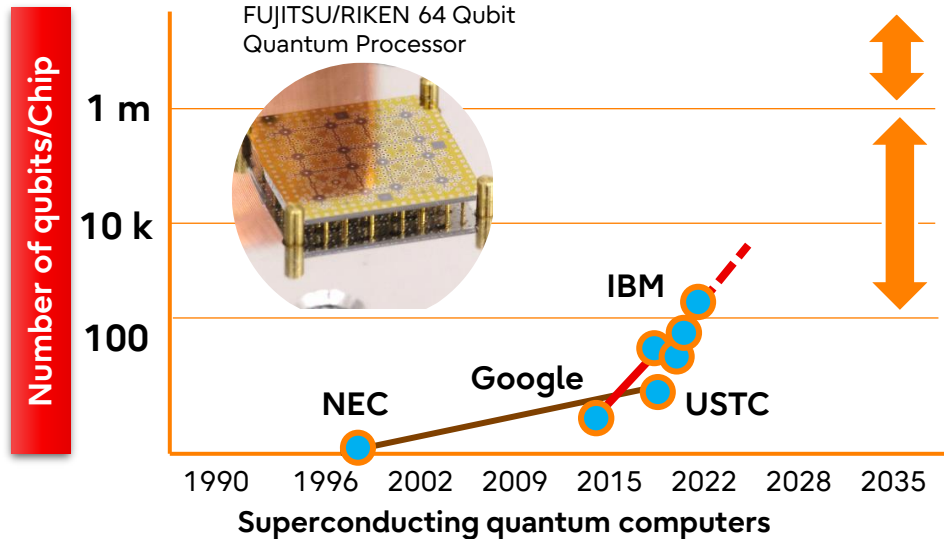


Computing Technology at Fujitsu



Need more than a million qubits for fault tolerant computation

- Current number of qubits is just over 400
- For the time being, aim to apply to specific applications with small systems
- Error suppression and correction technologies are very important



Fault-Tolerant Quantum Computer

NISQ* Computer
for limited applications

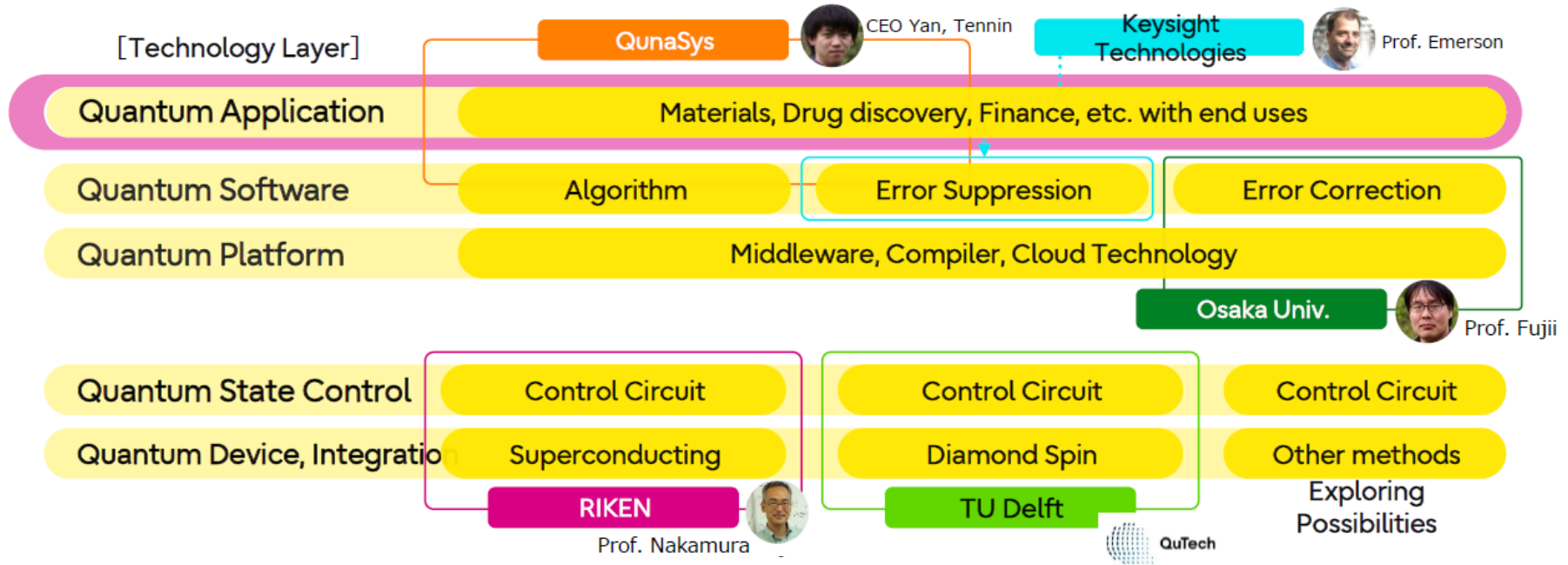
*NISQ : Noisy Intermediate Scale Quantum

"A full-fledged quantum computer, with 1000 logical qubits, might end up containing many millions of physical qubits",

Adrian Cho, Science, 2020/7/9

Fujitsu's Strategy for Quantum Computing

- Cover all the technology 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 a newly-developed quantum simulator



Next Generation Computing

Solve different problems with computer technologies

Own IP + Alliances



Drug
Discovery



Material
Discovery



Finance



Disaster
Recovery



Cryptography

High Performance Computing (HPC)



A64FX Technology



Standard x86
Solutions



Parallel
Filesystems

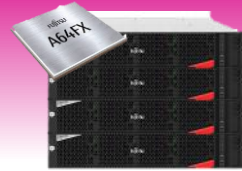


Storage +
Networking

Quantum-Inspired Technology



Digital Annealer



$|Q\rangle$

Quantum Simulator

Quantum Technology



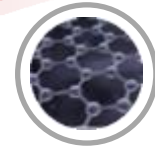
Quantum Computers

An available, future-proof bridge technology to quantum computing

Avoids complexity and energy costs
Operates at room temperature

Standard Infrastructure

High precision



Quantum Computers

Cloud or On Premise
(deployment anywhere between edge and cloud)

CPU / GPU
Server Systems



Quantum Adiabatic

to 10,000 times faster than industry standard compute*

■ Inspired by Quantum Parallelism (Superposition)

- Digital Annealer evaluates in parallel all relevant solution states out of 8192 possible bit flips

■ Inspired by Quantum Entanglement

- Full connectivity of the Digital Annealer enables instant interaction

■ Inspired by Quantum Tunnelling

- Evaluation of multiple energy potentials accelerate the finding of the best minimum

Fastest Quantum Computer Simulator

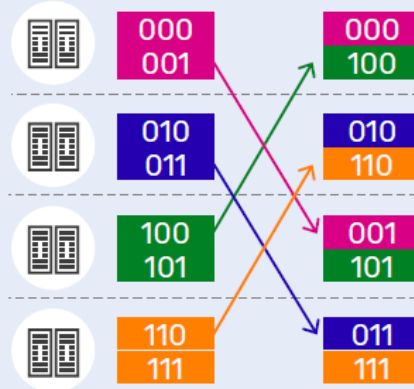
Developed the world's fastest 39-qubit quantum simulator by using A64FX processors

- Twice faster than simulators developed by other companies and research institutions
- To develop applications using this simulator with end users including Fujifilm, Tokyo Electron

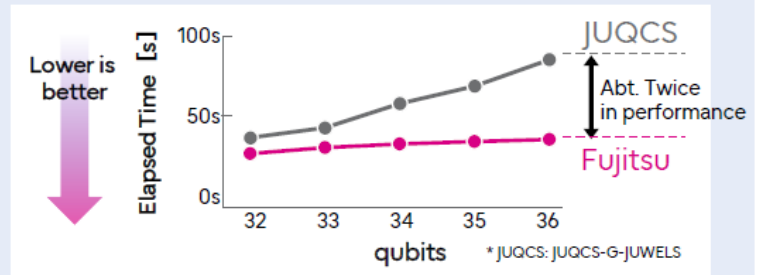
<https://arxiv.org/abs/2203.16044>

Data rearrangement according to the progress of quantum calculation

In the order of quantum calculation, the data is rearranged to reduce communication time



Mar. 30: Press conference & Press release



About twice in max. of the speed of JUQCS (Simulator for GPU)

- FUJITSU, con varias alianzas, está desarrollando nuevas tecnologías de computación cuántica



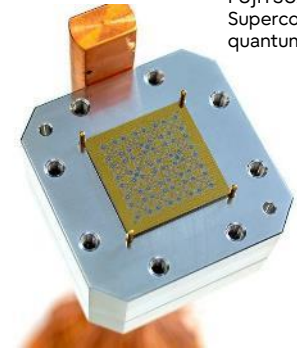
- Superconducting, gate-based universal quantum computer
- 64 qubits (2023), +100 qubits (2024), +1000 qubits (2026)
- Corrección de errores mejorada



- Diamond spin, gate-based universal quantum computer
- Operación a temperatura más alta (1-10K) que los qubits superconductores
- Las operaciones de puerta entre qubits distantes a través de la luz pueden evitar el ruido de diafonía



FUJITSU/RIKEN Quantum Computer
64 qubit superconducting gate-based



FUJITSU/RIKEN
Superconducting
quantum processor

Thank you

If you have any questions
relating to the content of this
document, please get in touch:

Juan Antonio Garcia

<juanantonio.garcia@fujitsu.com>

