

EN / LEARNING SERIES

Quantum Hardware Atlas

A practical comparison of leading processor platforms

SCIENCE · TECHNOLOGY · TALENT · FUTURE

Independent educational publication. Concepts are presented for learning and should be validated against primary technical sources for research, engineering or security decisions.

1. Superconducting circuits

Superconducting qubits are fabricated electronic circuits operated at millikelvin temperatures. They offer fast gates and mature fabrication, while cryogenic control and coherence remain major engineering challenges.

KEY TERMS

fast gates • cryogenics • microwave control

2. Trapped ions and neutral atoms

Trapped ions use internal atomic states with laser control and typically provide high-fidelity operations. Neutral atoms use optical tweezers and Rydberg interactions, enabling flexible arrangements and large arrays.

KEY TERMS

fidelity • laser control • connectivity • arrays

3. Photonics and spin qubits

Photonic approaches encode information in light and are naturally suited to communication. Spin qubits use electron or nuclear spin and may benefit from semiconductor manufacturing techniques.

KEY TERMS

photons • communication • spin • semiconductors

4. Compare evidence, not qubit counts

Qubit count alone does not measure usefulness. Compare gate fidelity, connectivity, coherence, speed, measurement quality, error mitigation and the resources needed for error correction.

For every claim, ask which workload was tested, against which classical baseline and under which operating conditions.

KEY TERMS

logical qubits • fidelity • benchmark • error correction

Suggested practice

Use the interactive modules at quantumserbia.com to test the ideas in this guide. Write down a prediction before every simulation, then compare the result and explain any difference.