Alice & Bob Publishes Quantum Computing Roadmap to 100 Logical Qubits in 2030

Alice & Bob's first white paper explains how cat qubits address the quantum computing field's issue of scaling and unveils their roadmap

PARIS, FRANCE, December 4, 2024 /EINPresswire.com/ -- Alice & Bob, a global frontrunner in the race for fault-tolerant quantum computing, has unveiled its white paper and five-year roadmap. The White paper outlines a clear path to achieving useful quantum computing through Alice & Bob's cat qubit technology, which promises to deliver high-fidelity logical qubits while using significantly fewer hardware and energy resources compared to alternative approaches.

ALICE & BOB

The roadmap details five key milestones in Alice & Bob's plan to deliver a universal, fault-tolerant quantum computer by 2030:
• Milestone 1: Master the Cat Qubit
Achieved in 2024 with the Boson chip series, this milestone established a reliable, reproducible cat qubit capable of storing quantum information while resisting bit-flip errors.
• Milestone 2: Build a Logical Qubit
Currently under development with the Helium chip series, this stage focuses on creating the company's first error-corrected logical qubit operating below the error-correction threshold.
• Milestone 3: Fault-Tolerant Quantum Computing
With the upcoming Lithium chip series, Alice & Bob aims to scale multi-logical-qubit systems and demonstrate the first error-corrected logical gate.
• Milestone 4: Universal Quantum Computing
The Beryllium chip series will enable a universal set of logical gates enabled by magic state factories and live error correction, unlocking the ability to run any quantum algorithm.
• Milestone 5: Useful Quantum Computing

The Graphene chip series, featuring 100 high-fidelity logical qubits, will deliver a quantum

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> *Raphael Lescanne, CTO and Co-Founder of Alice & Bob*

computer capable of demonstrating quantum advantage in early industrial use cases by 2030, integrating into existing high-performance computing (HPC) facilities.

"Our roadmap lays out a clear path to solving quantum's toughest engineering challenges," said Raphael Lescanne, CTO and Co-Founder of Alice & Bob. "Quantum computing can seem opaque, but it shouldn't be. This white paper makes our technology and roadmap accessible for engineers, business leaders and tech enthusiasts alike."

The white paper, titled "THINK INSIDE THE BOX: QUANTUM COMPUTING WITH CAT QUBITS," outlines Alice & Bob's endeavors by illustrating how quantum physics enables a richer computing model capable of addressing problems beyond classical computing, including simulations, machine learning and material science. Quantum computing promises transformative applications across industries such as finance, healthcare and cybersecurity.

Achieving practical quantum advantage requires overcoming the errors inherent in quantum systems. Quantum error correction typically relies on additional qubits to detect and correct these errors, but the resource requirements grow quadratically with complexity, making large-scale, useful quantum computing a significant challenge.

Alice & Bob's cat qubits offer a promising solution to this bottleneck. These superconducting chips feature an active stabilization mechanism that effectively shields the qubits from some external errors. This unique approach has enabled cat qubits to set the world record for bit-flip protection, one of the two major types of errors in quantum computing, effectively eliminating them.

This protection reduces error correction from a 2D problem to a simpler, 1D problem, enabling error correction to scale more efficiently. As a result, Alice & Bob can produce high-quality logical qubits with 99.9999% fidelity, what they call a "6-nines" logical qubit, using a fraction of the resources required by other approaches.

"Quantum computing should be a tool for solving useful problems in science and industry. This white paper shows how Alice & Bob's cat qubits can bring that vision to life in a practical way by the decade's end," said Théau Peronnin CEO and co-founder of Alice & Bob.
Alice & Bob's roadmap can be discovered as the [fourth part of the white paper](). The white paper is also available as an audio book narrated by Christopher Bishop on [Spotify]() and [Apple Podcasts]().

About Alice & Bob

Alice & Bob is a quantum computing company based in Paris and Boston whose goal is to create the first universal, fault-tolerant quantum computer. Founded in 2020, Alice & Bob has already raised €30 million in funding, hired over 100 employees and demonstrated experimental results surpassing those of technology giants such as Google or IBM. Alice & Bob specializes in cat qubits, a pioneering technology developed by the company's founders and later adopted by Amazon. Demonstrating the power of its cat architecture, Alice & Bob recently showed that it could reduce the hardware requirements for building a useful large-scale quantum computer by up to 200 times compared with competing approaches. Alice & Bob cat qubit is available for anyone to test through cloud access. Follow Alice & Bob on LinkedIn, X or YouTube, visit their website www.alice-bob.com, or join The Cat Tree on Slack to learn more.

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