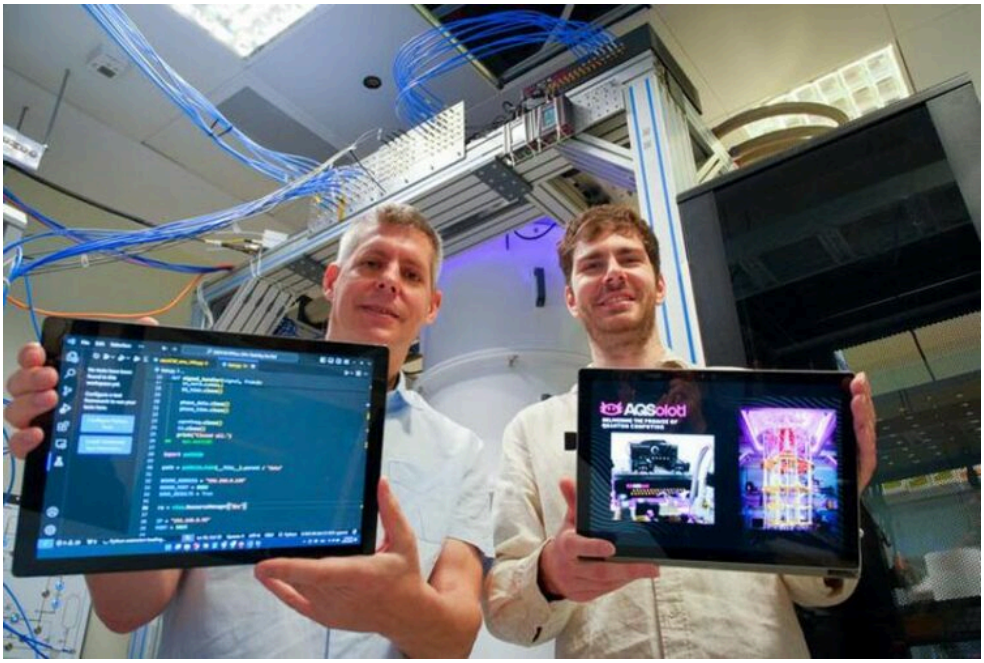
NTU and NUS spin-off cutting-edge quantum control technology



NTU Assoc Prof Rainer Dumke (left) with AQSolotl CEO Patrick Bore (right), with their Chronos-Q quantum controller (in black) seen in the top right corner of the quantum computer at NTU.
Credit: NTU Singapore

AQSolotl's quantum controller is designed to be adaptable, scalable and cost-efficient.

Quantum technology jointly developed at **Nanyang Technological University, Singapore (NTU Singapore)** and **National University of Singapore (NUS)** has now been spun off into a new deep tech startup, **AQSolotl**.

The startup's flagship product, **CHRONOS-Q,** is a quantum controller that acts as a translator between conventional computing systems and quantum computers.

Developed by university researchers affiliated with **Singapore's Centre for Quantum Technologies (CQT)**, it enables users to control quantum computers easily and efficiently using their laptops and desktop computers.

Unlike traditional computers that operate on a binary system of 1s and 0s, quantum computers utilise the principles of quantum mechanics to achieve vastly superior computational capabilities.

Instead of binary bits, quantum computers use quantum bits (qubits), which can exist in multiple states at the same time, effectively enabling them to represent multiple possibilities simultaneously.

Quantum computers will solve problems once considered unsolvable by conventional computers, opening new possibilities in fields like cryptography, advanced simulations and AI. They are theorised to be many thousands of times more powerful than today's fastest silicon processors for some complex computational tasks.

When compared to competing quantum controllers, CHRONOS-Q excels in speed at a fraction of the cost and the size. For example, determining qubit states takes less than 14 nanoseconds (1 nanosecond is 1 billionth of a second) enabling real-time feedback.

The controller is designed to scale easily as quantum computers increase in power, has customisable and upgradable firmware, and can integrate additional modules in future.

The proprietary quantum controller technology, developed and refined over three years, is currently being piloted at CQT as part of the hardware setup for the National Quantum Computing Hub and NTU's Nanyang Quantum Hub.

AQSolotl's founders include **NTU Professor Rainer Dumke**, a Principal Investigator at CQT, and **Mr Patrick Bore**, a former Research Associate from CQT at NUS, who is now the CEO of AQSolotl.

A co-inventor of the technology, **Prof Rainer Dumke**, explains that quantum computing will accelerate the development of many fronts, from more accurate models such as for climate change and energy efficient databases to smarter AIs and more secure financial transactions.

"Conventional computer systems form the backbone of modern society, powering banking systems, databases, and data centres. Today, we are witnessing AI revolutionise these systems, transforming how we process and utilise data. Quantum computing, however, promises an even greater impact," Prof Dumke said.

"Future quantum systems will solve complex mathematical and physics problems previously deemed unsolvable, such as factorising large prime numbers for advanced cryptography and modelling quantum physics. These quantum advancements could also enable us to address some of humanity's greatest challenges, including climate change and new emergent diseases, for instance, by accelerating the development of renewable energy systems and precision medicine."

"How our efficient quantum technology can contribute, is to accelerate these developments and bring quantum computing to more spaces at cost-effective prices, so that quantum computing can become mainstream and accessible for most countries and not just for wealthy nations."

As part of the commercialisation process, the intellectual property (IP) for the technology has been transferred to AQSolotl, with both NTU and NUS taking equity shares in the company, while retaining rights for academic, research, and non-commercial use.

Patrick Bore, CEO of AQSolotl, said: "We are thrilled to take this step forward with the support of NTU and NUS, institutions renowned for their quantum research. Our CHRONOS-Q system demonstrates that quantum controllers can be both high-performing and cost-effective, paving the way for scalable applications across industries. We look forward to bringing real-world solutions to companies around

the world, helping to advance quantum AI development and lower the barriers to entry for quantum computing."

"This milestone exemplifies how cutting-edge academic research from leading institutes can lead to commercialisable deep tech innovations that benefit Singapore and beyond. With the founding of AQSolotl, we anticipate they will actively contribute back to the ecosystem and drive global advancements in quantum computing technologies," said **Professor Chen Tsuhan, Deputy President, Innovation & Enterprise, NUS**.

The CHRONOS-Q system is a product of years of collaboration and research within Singapore's national quantum ecosystem.

The startup is currently supported and incubated by the **NTU Innovation and Entrepreneurship (NTU I&E) initiative**.

Professor Louis Phee, Vice President (NTU Innovation & Entrepreneurship), said, "NTU's I&E initiative is committed to supporting deep tech, such as quantum technologies, that has potential for significant impact. Through our venture-building programmes, we work closely with faculty and researchers to refine their business models, scale their prototypes, and bring their innovations to market. By providing mentorship, resources, and opportunities for collaboration within NTU, we empower entrepreneurs to turn groundbreaking ideas into market-ready solutions."

Through innovative designs that are both scalable and cost-efficient, AQSolotl aims to accelerate quantum adoption and help position Singapore as a leader in quantum innovation and technologies.

The company is currently raising funds for enabling AI integration and will also offer customised solutions for companies wishing to buy their own cost-effective full quantum computing system.