

Terra Quantum and Apex.AI Demonstrate Quantum-Safe Security for Long-Lived, Cloud-Connected, Software-Defined Systems

Successful implementation demonstrates secure edge-to-cloud communication using NIST-standardized post-quantum cryptography while preserving existing application architectures and software investments.

St. Gallen, Switzerland and Palo Alto, CA, USA – 23 July 2026 – Terra Quantum, a global leader in quantum technologies, and Apex.AI, a leading provider of safe and secure software for software-defined vehicles and intelligent machines, today announced the successful implementation of NIST-standardized post-quantum cryptography (PQC) for secure communication between an Apex.AI-based robotic software environment and a cloud-based control system.

The collaboration demonstrates how connected robotic, automotive, and defense systems can securely exchange information with cloud services using standardized quantum-resistant cryptography while preserving the communication patterns and distributed software architectures that modern intelligent systems rely on. The implementation provides a practical blueprint for bringing quantum-safe security to long-lived connected systems without requiring fundamental changes to existing applications.

As quantum computing continues to advance, many of today's widely deployed public-key cryptographic algorithms are expected to become vulnerable to cryptographically relevant quantum computers. For software-defined vehicles, autonomous systems, connected robotics, data of national security concern, and platforms designed to remain in service for decades, this creates a long-term cybersecurity challenge. These systems increasingly depend on secure communication with cloud-based services for monitoring, diagnostics, software updates, fleet management, coordination, and remote operation, making the transition to quantum-resistant security an important priority.

The implementation combines Terra Quantum's post-quantum cryptography capabilities with Apex.OS to enable secure cloud communication using NIST-standardized quantum-resistant cryptographic algorithms. Apex.OS provides the software-defined robotics and intelligent-machine foundation for this joint solution, enabling secure edge-to-cloud communication in an application environment representative of modern autonomous and connected systems. Importantly, the solution preserves existing communication workflows and application architectures, enabling organizations to strengthen cybersecurity while maintaining compatibility with modern distributed software systems.

"Connected intelligent systems are rapidly becoming critical infrastructure," said Markus Pflitsch, CEO, Founder and Chairman of Terra Quantum. "The vehicles, robots, and industrial systems being deployed today will still be operating when quantum computers begin challenging today's cryptographic standards. Organizations cannot afford to wait until that moment arrives. This implementation demonstrates that NIST-standardized post-quantum cryptography is ready to protect cloud-connected systems today, providing a practical path toward quantum resilience without disrupting existing software architectures."

Dr. Florian Neukart, Chief Technology Officer at Terra Quantum, added: "The transition to post-quantum cryptography must be practical, standards-based, and interoperable with the software systems organizations already operate. Our collaboration with Apex.AI demonstrates that NIST-standardized post-quantum cryptography can be integrated into modern robotics and software-defined vehicle environments without changing application logic or communication architectures. By preserving existing development workflows while strengthening cryptographic resilience, we enable organizations to begin their migration to quantum-safe security today."

Dr. Jan Becker, CEO at Apex.AI, said: “Software-defined vehicles, intelligent machines, and connected defense systems increasingly rely on trusted communication with cloud infrastructure throughout their operational lifetime. Our collaboration with Terra Quantum demonstrates that standardized post-quantum cryptography can be integrated into modern robotics software environments while preserving the flexibility, scalability, and communication models developers rely on to build next-generation intelligent systems. For organizations developing platforms that may remain in operation for years or decades, preparing for post-quantum security is becoming an important lifecycle consideration that should be addressed early in the architecture and product planning process.”

Unlike approaches that require redesigning applications or communication frameworks, the demonstrated implementation enables organizations to begin adopting standardized post-quantum security using technologies available today. By preserving established software architectures while replacing vulnerable cryptographic building blocks, organizations can prepare long-lived connected systems for the post-quantum era with minimal operational disruption.

The implementation is particularly relevant for industries operating mission-critical connected assets, including robotics, autonomous mobility, industrial automation, manufacturing, logistics, aerospace, defense, and critical infrastructure, where devices deployed today must remain secure throughout operational lifecycles that often extend well beyond the arrival of cryptographically relevant quantum computers.

Beyond securing individual platforms, the joint solution enables quantum-safe protection of interconnected Systems-of-Systems operating across cloud, edge, autonomous, and mission networks. In line with NATO’s Multi-Domain Operations approach, resilient and interoperable communication infrastructures are essential to orchestrate effects across land, air, maritime, cyber, and space domains. The demonstrated architecture provides a scalable foundation for secure information exchange and mission assurance across complex, software-defined operational ecosystems.

As governments and industry accelerate the adoption of NIST’s post-quantum cryptographic standards, the collaboration demonstrates that organizations can begin their migration to quantum-safe communication today using standardized technologies without redesigning existing software-defined systems.

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About Terra Quantum

Terra Quantum Group is a leading quantum technology company based in Germany and Switzerland. It provides “Quantum as a Service (QaaS)” in three core areas, the first one being “Quantum Algorithms as a Service”. Here, customers are provided access to an extensive library of algorithms, such as hybrid quantum optimization and hybrid quantum neural networks, which can be used for solving complex logistics problems or pattern recognition, among other things. Terra Quantum also develops new quantum algorithms for its customers or adapts existing algorithms to their specific needs. Secondly, through “Quantum Computing as a Service”, Terra Quantum offers its customers access to its proprietary high-performance simulated quantum processing units (QPU), the quantum ecosystem’s physical QPUs, while also developing native QPUs. The third division is “Quantum Security as a Service,” through which Terra Quantum offers its unique solutions for secure quantum and post quantum communications worldwide. Visit us on [LinkedIn](#) and our [webpage](#).

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About Apex.AI

Apex.AI is an international software company specializing in the development of safety-certified, developer-friendly, and scalable software for mobility systems, aiming to accelerate the transition to software-defined vehicles and mobility. Founded in 2017 by Jan Becker and Dejan Pangercic, the company is based in Palo Alto, California, with offices in Munich, Stuttgart, Tokyo, and Pangyo. To date, Apex.AI has raised over \$75 million USD from world-class venture, financial and strategic investors including AGCO, Airbus Ventures, Canaan, Continental AG, Daimler Truck, HELLA Ventures, Jaguar Land Rover's InMotion Ventures, LG Electronics, Lightspeed, Orillion, Toyota Ventures, Volvo Group Venture Capital and ZF. The company's flagship product, Apex.OS, consists of two core components: Apex.Grace and Apex.Ida. Visit us on [LinkedIn](#) and our [webpage](#).