The European Quantum Communication Infrastructure (EuroQCI) Initiative

The European Commission is working with all 27 EU Member States, and the European Space Agency (ESA), to design, develop and deploy the EuroQCI, which will be composed of a terrestrial segment relying on fibre communications networks linking strategic sites at national and cross-border level, and a space segment based on satellites. It will be an integral part of IRIS² (https://defence-industry-space.ec.europa.eu/eu-space-policy/eu-space-programme/iriss_en), the new EU space-based secure communication system.

The EuroQCI will safeguard sensitive data and critical infrastructures by integrating quantum-based systems into existing communication infrastructures, providing an additional security layer based on quantum physics. It will reinforce the protection of Europe's governmental institutions, their data centres, hospitals, energy grids, and more, becoming one of the main pillars of the EU's Cybersecurity Strategy (https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2391) for the coming decades.

The EuroQCI will make use of innovative quantum communication technologies such as those developed by the researchers of the EU-funded Quantum Technologies Flagship (https://qt.eu/), and building in particular on the activities of the Horizon 2020 OPENQKD project (https://openqkd.eu/). The involvement of European industry partners and SMEs is also crucial to ensuring that the critical components of EuroQCI are based on European technologies, and ultimately to boosting Europe's scientific, technological and industrial capabilities in cybersecurity (https://digital-strategy.ec.europa.eu/en/policies/cybersecurity-policies) and quantum technologies (https://digital-strategy.ec.europa.eu/en/policies/quantum-technologies-flagship). The initiative will thus contribute to European digital sovereignty and industrial competitiveness, and help to meet Europe's Digital Decade (https://commission.europa.eu/strategy-and-policy/priorities-2019-2024/europe-fit-digital-age/europes-digital-decade-digital-targets-2030_en) target of being at the cutting edge of quantum capabilities by 2030.

Towards an operational EuroQCI

The EuroQCI was launched in 2019 with the EuroQCI Declaration (https://digital-strategy.ec.europa.eu/en/news/future-quantum-eu-countries-plan-ultra-secure-communication-network), initially signed by seven Member States: all Member States subsequently joined the initiative. Since then, work has continued, under the supervision of the Commission and implemented by the Member States in the case of the terrestrial segment, and by ESA in the case of the space segment.

Terrestrial segment

For the terrestrial segment, the Commission first funded two industry consortia to conduct system design studies defining the EuroQCI's architecture. The findings of these studies are now paving the way to the deployment of the EuroQCI.

The EuroQCI's first implementation phase started in January 2023 with the support of the Commission's Digital Europe Programme (https://digital-strategy.ec.europa.eu/en/activities/digital-programme), with a focus on the following areas:

- A set of industrial projects (https://petrus-euroqci.eu/industrial-qkd-projects/) to develop and mature the key technological building blocks for the EuroQCI, with the aim of developing Europe's quantum communication ecosystem and industry.
- National projects (https://petrus-euroqci.eu/national-euroqci/) allowing Member States to design and build the national quantum communication networks that will form the basis of the terrestrial segment, testing different technologies and protocols and adapting them to the specific needs of each country.
- A coordination and support action, PETRUS (https://petrus-euroqci.eu/), to act as a link between all projects, facilitate collaboration, and identify standardisation needs.

These first Digital Europe projects will together make it possible to take the first steps towards services offering operational quantum key distribution (QKD), a highly secure way of exchanging encryption keys.

Alongside this, the Connecting Europe Facility (https://digital-strategy.ec.europa.eu/en/activities/connecting-europe-facility) (CEF) will provide funding for projects developing cross-border links between national networks, and interconnections with the EuroQCI's space component.

In addition, since January 2024, the European Commission has launched a four year project (NOSTRADAMUS) setting up a testing and evaluation infrastructure (https://ted.europa.eu/udl?uri=TED%3ANOTICE%3A727409-2023%3ATEXT%3AEN%3AHTML) that will enable QKD-based technologies and services to be assessed and validated with a view to certification, so that users can be confident that they will not be vulnerable to attacks. This infrastructure will be progressively deployed and then transferred to and hosted by the Commission's Joint Research Centre in Ispra, Italy. Operational activities are planned to start from 2026 onwards.

Building on this funding from Digital Europe and CEF, the further development of national networds and interconnections with the space component will be funded under the IRIS² space-based secure communication system.

Space Segment

For the space segment, the Commission is currently working with ESA on the specifications of a first generation constellation of EuroQCI satellites. This will build on the first prototype satellite Eagle-1 (https://www.esa.int/Applications/Telecommunications_Integrated_Applications/Eagle-1), developed by ESA and an industrial consortium, and due to be launched in late 2025 or early 2026.

Future activities will be planned and funded under IRIS².

To get in touch with the Commission regarding the EuroQCI, please contact CNECT-QCI@ec.europa.eu (mailto:CNECT-QCI@ec.europa.eu)

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