



Redefining Security

Use Case: National Research and Education Network Infrastructure

Building a QKD Network between Poznan and Warsaw to provide a secure communication infrastructure for digital science, economy and social innovations

Innovative QKD services for a variety of users in Poland



Customer: Poznan Supercomputing and Networking Center (PSNC)

Industry: National Telecommunication Infrastructure

Country: Poland



Business need



Establish a secure intercity link between Poznan and Warsaw

Solution



Add Quantum Key Distribution to the Polish National Research and Education Network

Results



380km-long link offering new secure services

Business need

The Polish NLPQT – National Laboratory for Photonics and Quantum Technologies – project was aiming at developing a country-wide quantum communication infrastructure. This infrastructure would initially enable research and development work on QKD and investigate its integration with other mechanisms currently used to secure data transmitted over IT and telecommunication systems. This will later lead to the design, launch and development of complex and secure systems for real-world applications.

Within this project, the Poznan Supercomputing and Networking Center (PSNC) was looking to establish an intercity QKD link between Poznan and Warsaw to provide a secure link for a series of use cases and applications. The PSNC had previously worked with IDQ in 2020 to establish a [secure QKD network for metro applications and uses cases, including the world's first cross-border QKD interconnection](#).

Solution

The QKD link was established using IDQ's [Cerberis XG series](#), the fourth generation of QKD devices, launched in 2021. The QKD transmission system uses the dedicated PIONIER – Polish National Research and Education – fiber network, operated by the PSNC, on a total length of 380 km between Poznan and Warsaw.

The installed QKD system relies on the so-called “Trusted node” configuration. It has five intermediate transmission nodes, linked by six QKD segments. Each node can use the services of the QKD system to distribute keys locally. Depending on the segment the maximum achieved key rate is 2.5 kbps and the Quantum Bit error rate in the range of 2 %.

The whole QKD transmission system and its parameters are monitored by PSNC Network Operations Centre, which uses IDQ's Quantum Management System (QMS) to configure and manage the links.

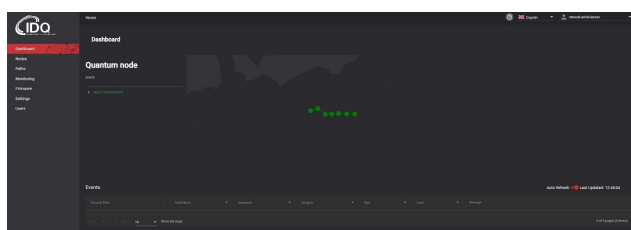


Fig. 1 Poznań – Warsaw QKD link QMS dashboard.



Fig. 2 Poznań-Warsaw QKD link parameters for selected segment.

The PSNC as High Performance Computing Center and Research and Education Network provides services to a wide range of users. Its applications and use cases are connected with digital science, digital economy and social innovations.

The QKD infrastructure is being implemented especially in the area of data centre interconnect and data transmission services. This approach allows to develop new services and infrastructure for a number of use cases at the same time – for example: telemedicine, medical data, data storage, and public services provided by local administration units.

Results and next steps

The goal of the PSNC is to further integrate its local metro QKD infrastructure, which was developed last year in Poznan, with this new long-distance Poznan-Warsaw QKD link. The final goal is to interconnect all High Performance Computing Centers in Poland and to establish common access layers to QKD services. This will provide access hubs for different use cases and connected applications such as telemedicine, medical data transmission, data storage, and public services provided by local administration units. Selected nodes will act also as possible cross-border QKD infrastructure nodes, which will open new possibilities for international QKD infrastructure and services. This pan-European aspect is especially important as PSNC and the PIONIER network are part of the European Research and Education Community.

As a next step, test workstations enabling the development of applications of single quantum objects, such as electrons, quantum dots, or atoms will be established within the framework of the NLPQT project. Possible interactions of these local material quantum objects with photonic objects, as provided by the QKD systems will form the basis of a quantum communication network. New functionalities enabled by properties of single quantum objects will find applications in numerous areas.

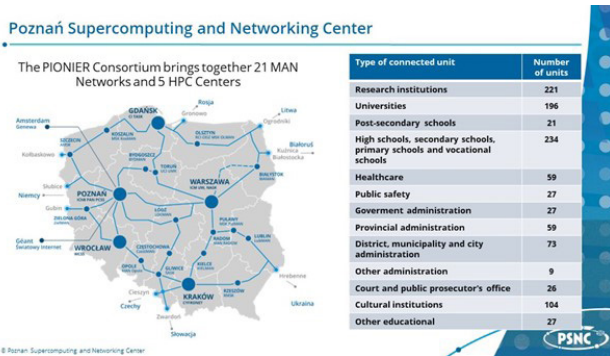


Fig. 3 PIONIER network

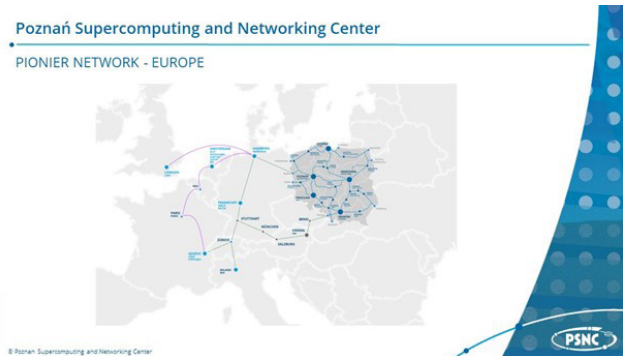


Fig. 4 PIONIER network in Europe

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Launching the QKD link between Poznań and Warszawa is the first stage to building a nationwide quantum communication network, providing access to modern technology to companies and organizations seeking to protect their assets in the post quantum era.

Artur Binczewski, Director of Network Technologies Division at PSNC

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This is the first large-scale national deployment in Europe and we feel honored to support Poznań Supercomputing and Networking Center once again to help them offer new secured services to their customers in Poland, with the aim of extending internationally in the near future.

Grégoire Ribordy, CEO and co-founder of ID Quantique