



Poznan Supercomputing
and Networking Center



Visit us at booth #827



Open Innovation Ecosystem for Science

SC22 Conference, Dallas, USA, November 14-17, 2022

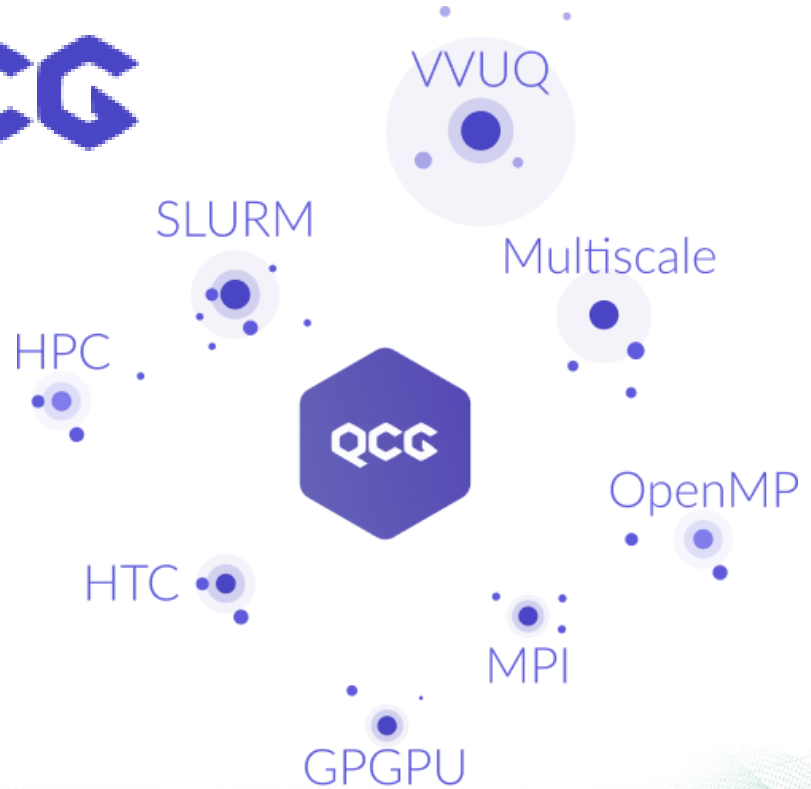
QCG - When the Quality of Computing is Guaranteed

The QCG software delivers a set of highly efficient services and access tools for remote application execution in large-scale computing environments, including HPC, HTC and Cloud systems.

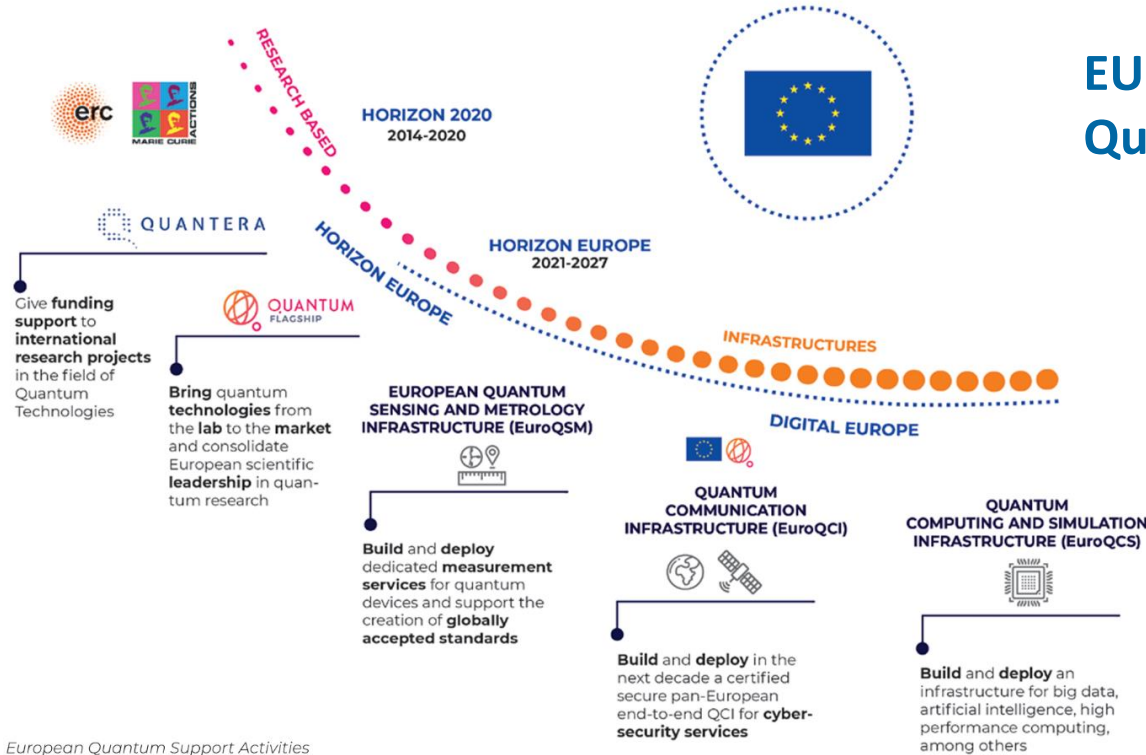
The QCG ecosystem provides all the necessary mechanisms for efficient computations on large-scale resources. It takes care of task submission, data management and security. It is easily adjustable to specific needs.

And just as importantly, it is open source!

QCG



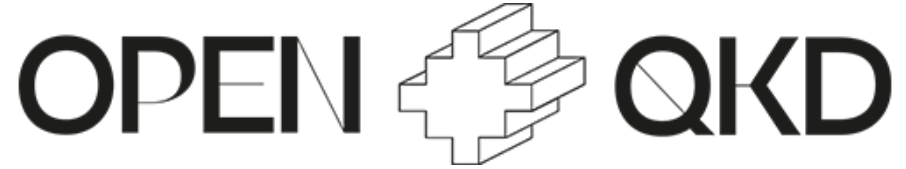
EUROQCI
Quantum Flagship Program



OPENQKD will raise awareness of the maturity of QKD and its seamless integration into existing security and networks for a wide range of use-cases

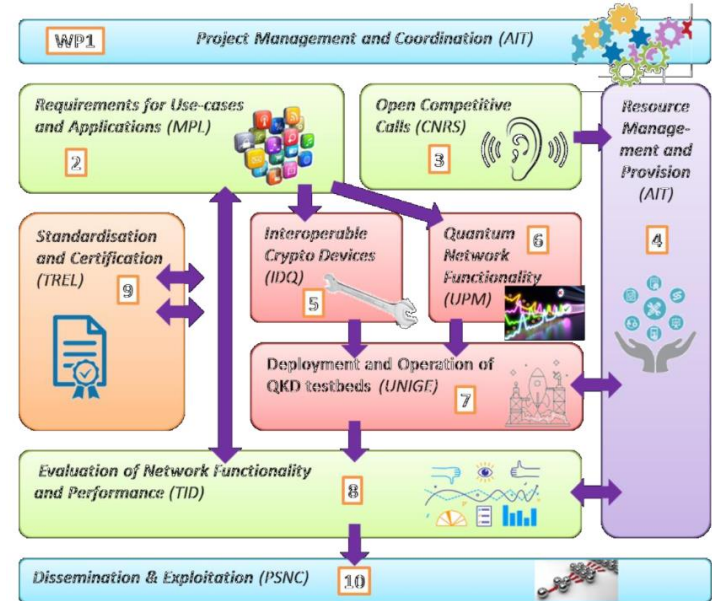
Objectives

- Establishment of the first QKD-enabled experimentation platform,
- Standardized interfaces,
- Operation of use-cases deriving from Secure Societies needs,
- Range of use-cases,
- Open, robust, reliable, modular and fully monitored testbed facility,
- Contribute to quantum cryptography standardization and security certification efforts,
- Lay the foundations for a Pan-European Quantum Network,
- Kick-start a competitive European QKD industry.



OPEN QKD

- OPEN QKD - construction of **QKD testbeds** in Europe and implementation of 40 different scenarios for services using QKD technology,
- Project start - October 2019,
- Poznan is one of the main testbeds. Implementation and integration of QKD technology in the existing infrastructure and services of the POZMAN and **PIONIER networks**,
- Testing **experimental QKD solutions** in Poznan,
- Testbeds currently running in Geneva, Madrid, Berlin.



NLPQT - National Laboratory for Photonics and Quantum Technologies

The main goal of the project is development of **modern infrastructure in the fields of photonics and quantum technologies**, with particular attention paid to the needs of industry.

Potential recipients of the results and research infrastructure established under and as part of the NLPQT project are both other **research institutions and commercial recipients**, industry looking for advanced solutions.



NLPQT - National Laboratory for Photonics and Quantum Technologies

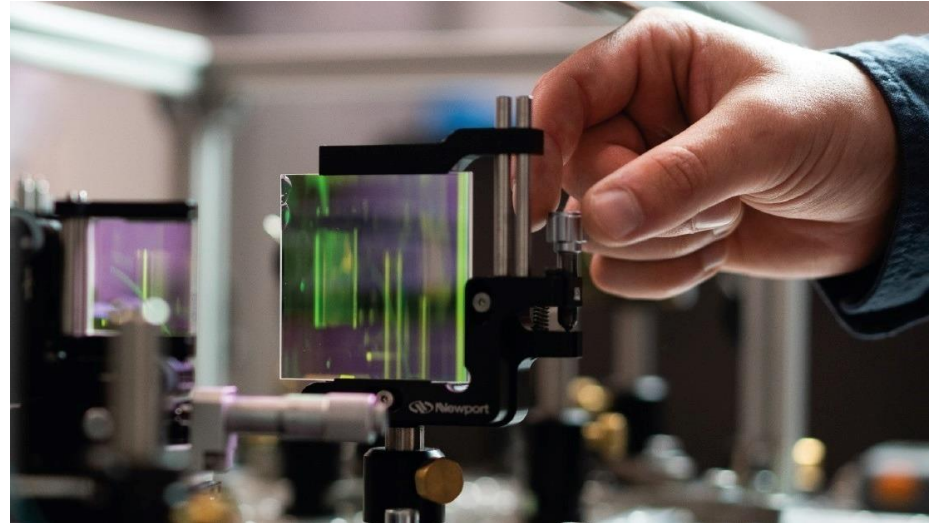


Construction of metro QKD research and operational infrastructure, integration of QKD solutions

- **QKD infrastructure** (operational and R&D QKD devices, encoders and quantum random number generators)

Construction of the **QKD Poznań - Warsaw** link

- **Experiments** related to **quantum communication** between University of Warsaw nodes and PSNC in Warsaw.
- **Experiments** related to **sources and detectors of single photons**
- Integration of the infrastructure with the **optical carrier infrastructure**
- **Next generation QKD prototypes** testing (based on entanglement)



Transfer Optical Carrier in PIONIER Network

- Optical carrier distributing point
- Points of access to the optical carrier

Optical Carrier Network:

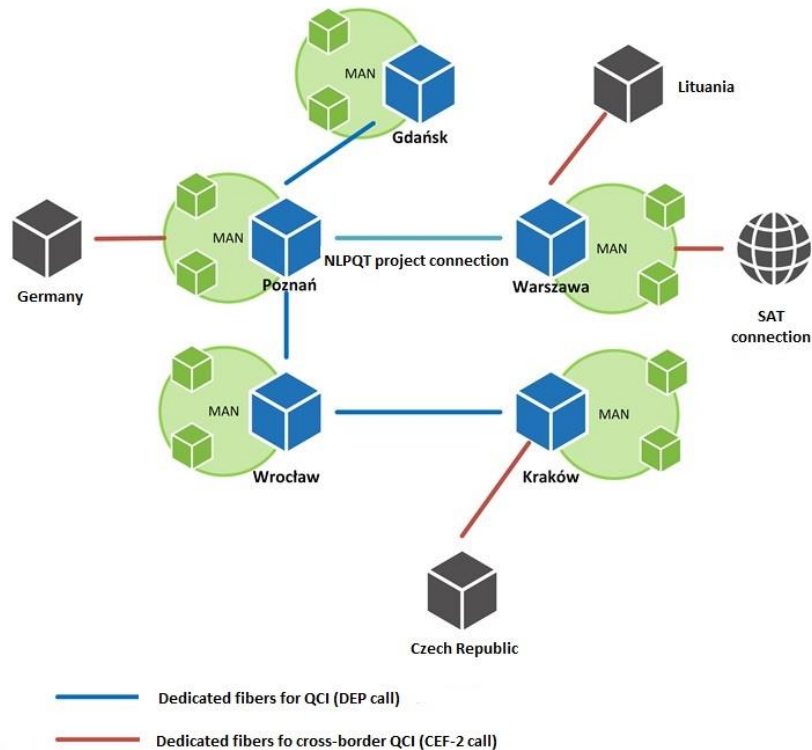
- Toruń - Poznań evaluated link
- Poznań - Warszawa, Poznań - Wrocław links
- Future international connections
- PIONIER Network

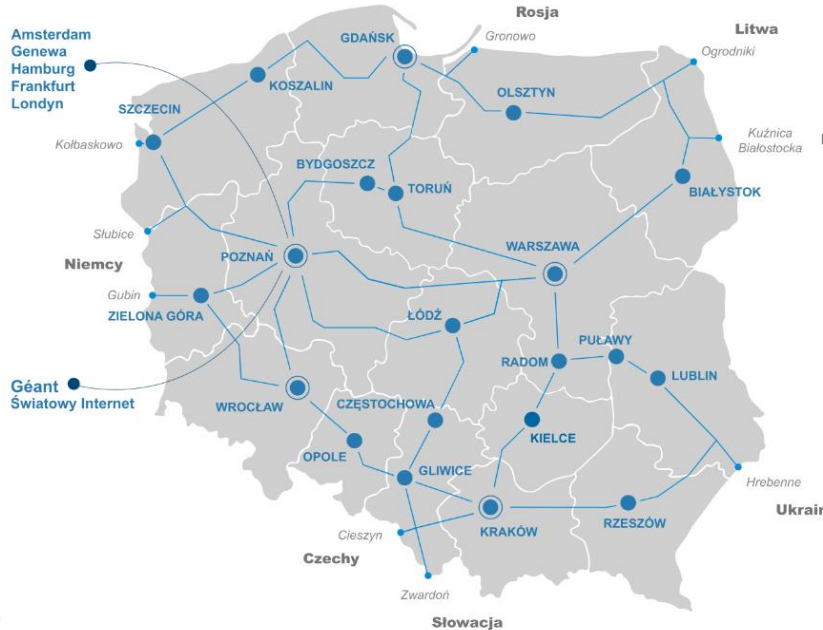


NATIONAL LABORATORY FOR
PHOTONICS & QUANTUM
TECHNOLOGIES

<http://nlpqt.fuw.edu.pl/en/>

QCI proposal based on PIONIER network and MAN, HPC centers





PIONIER-LAB

National Platform for Integrating Research Infrastructures with Ecosystems of Innovation

The project is a **response** of the Polish scientific community to **major problems concerning research** being undertaken in Poland and the cooperation of Polish industry with science.

The immediate **aim of the project** is to increase the level of market uptake of research outcomes.

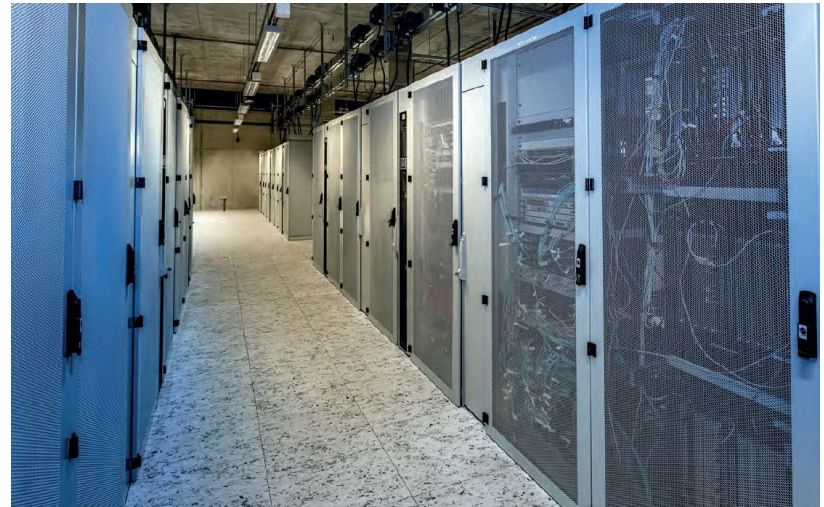
Sophisticated ICT services, will enable close cooperation between the industrial sector and the academic environment in Poland in order to carry out **joint research and industrial activities** aimed at bringing down barriers related to low effectiveness of transfer of research results to the economy.

8 closely related research laboratories and a shared cooperation space for science and industry:

- Laboratory of Innovative Network Technologies
- Distributed Time and Frequency Laboratory
- Smart Campus as Smart City Laboratory
- Regional "Living" Innovation Labs inspired by ICT
- Cloud Services Laboratory
- Multi-scale Simulation Laboratory
- Laboratory and e-Training Services (in the scope of PIONIER-LAB and technology-inspired innovations)
- Preincubation Laboratory

PIONIER-LAB 

National Platform for Integrating Research Infrastructures with Ecosystems of Innovation





PL-5G

National Laboratory for Advanced 5G Research

The research infrastructure will follow the 5G architecture and consists of **3 complementary laboratories:**

- **5G network laboratory** will be built using state-of-the-art 5G solutions (wireless and wired access networks, edge cloud computing, core network, and central cloud computing),
- **Laboratory of 5G simulators and measurement tools** will provide 5G simulators and corresponding measurement tools,
- **5G environment laboratory** will supply a research infrastructure supporting users in developing new 5G-ready network solutions, platforms, and applications.

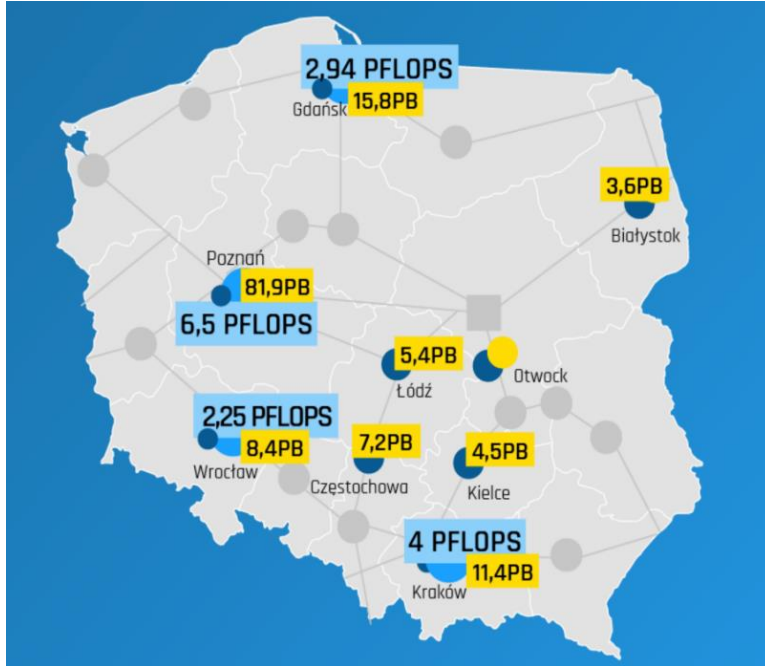


PL-5G

National Laboratory for Advanced 5G Research

The main objective of the project is to **set up a nationally-unique research infrastructure** for the practical investigation of new techniques and solutions in the area of next-generation 5G networks and services.

Access to the PL-5G network will be available to all interested parties and managed by a **dedicated platform**. The platform will support end users with experiment setup and configuration. On top of that, it will provide **remote access to the research infrastructure**, allowing users to run experiments from various locations.



PRACE-LAB



Cooperation on Advanced Computing in Europe

The advanced e-infrastructure (cloud/data and HPC), based in **8 geographically distributed sites**, is connected to the national academic **PIONIER network** with the speed of 100-400 Gbps in fullmesh technology and to the European GÉANT network.

The integration of this infrastructure with the European EuroHPC and PRACE HPC systems is planned at a later stage and will allow us to take advantage of the national resources under a wider European ecosystems.



PRACE-LAB



Cooperation on Advanced Computing in Europe

The PRACE-LAB provides production-based **advanced computing** and data storage services, standing behind the **scientific community** in Poland and Europe and, at the same time, being capable of offering competitive services for industry in cloud computing/cloud data, and virtual environments, as well as specialized expertise in cybersecurity.

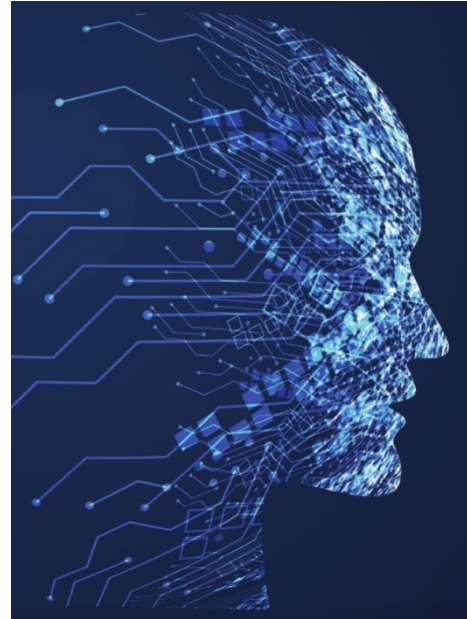
The direct goal of the project is to build a widely available HPC infrastructure consisting of **high-performance computing servers**, specialized processing units and resilient data management systems.

MOSAIC

The European Center for **Bioinformatics and Genomics**

- New infrastructure for large-scale and **multi-level studies** of **biological systems**
- **Precise therapeutic strategies**
- **Single-cell biology**, organoids, and **Artificial Intelligence**

The main objective of the project is to provide a research platform enabling the acquisition of multidimensional biomedical and clinical data as well as their standardization, integration and analysis with the use of artificial intelligence algorithms.



MOSAIC

The European Center for **Bioinformatics** and **Genomics**

The infrastructure of the MOSAIC platform will create a highly **calibrated ecosystem** to conduct **innovative biomedical research** combining high-throughput multiomic analysis and data analysis by means of **artificial intelligence methods**, and will also become a source of knowledge and tools enabling the development of new preventive, diagnostic, and therapeutic approaches.

The platform represents a utilitarian implementation of the key elements of a **disruptive strategy for the evolution of biomedical and clinical research in Europe**, developed by the LifeTime consortium, whose founding member is the **Institute of Bioorganic Chemistry of the Polish Academy of Sciences**.



DARIAH-PL

Digital Research Infrastructure for the Arts and Humanities

1. Objective of [DARIAH-PL](#) - Polish national large-scale development and infrastructure project started in 2021
2. Funded under the [Smart Growth Operational Programme](#) 2014-2020 in the area „Development of modern research infrastructure of the science sector”
3. Built by a [consortium of 16 Partners](#), 15 of which are members of DARIAH-PL - the largest humanities consortium in Poland
4. Comprises laboratory equipment, software tools, integrated digital resources from various fields of the art and humanities research
5. Recognized as [Time Machine Project](#)

Cultural Heritage

Access to and analysis of information about national culture in all its dimensions, i.e. source texts, their annotated critical editions, information about objects and forms of culture, etc.

Geoarchaeology

Non-invasive analysis and documentation of land, landscape or monuments.

Musicology

Research on traditional music and on the perception of musical phenomena (human cognitive sphere).



DARIAH-PL



Digital Research Infrastructure for the **Arts** and **Humanities**

A Network of Distributed Research Laboratories

- Complex infrastructure with a single access point
- Designed based on [research scenarios analysis](#)
- [Browsable/searchable](#) by well known taxonomies (e.g. TaDiRAH, ACM CCS) as well as geographical location and institutional attribution
- Exposed as a [dataset](#) for an easy integration with existing catalogues, inventories or marketplaces





National Data Storage



Universal infrastructure for data storage, access, and potent processing of large data volumes in **HPC**, **Big Data**, and **Artificial Intelligence** computing models

- Up to **1 Exabyte archivization** and long-term storage
- Data storage infrastructure and systems laboratory
- Services embedded in storage laboratory
- Services and applications for data access laboratory
- Repository services laboratory
- Edge computing laboratory

National Data Storage



Universal infrastructure for data storage, access, and potent processing of large data volumes in **HPC**, **Big Data**, and **Artificial Intelligence** computing models

The foundation of the project is an update of the current architecture into an open, modular, expandable as well as decentralized and scalable **data warehouse**, equipped with many **access interfaces**, integrated services, and applications, including mechanisms supporting effective storage and data access, long-term management, **data mining**, analysis, and efficient processing.

By the end of 2023, the infrastructure will increase the capacity of the data storage infrastructure by **200 petabytes**, the tape space by **180 petabytes** and the **Data Lake model** used in its construction will keep its high flexibility.



DATA LAKE

- Dynamic data repositories
- Unstructured data processing
- Advanced analysis of historical and real-time data



EDGE COMPUTING

- Processing Big Data from distributed sources
- High level integration of processing and storage services
- Real-time data processing



BIG DATA

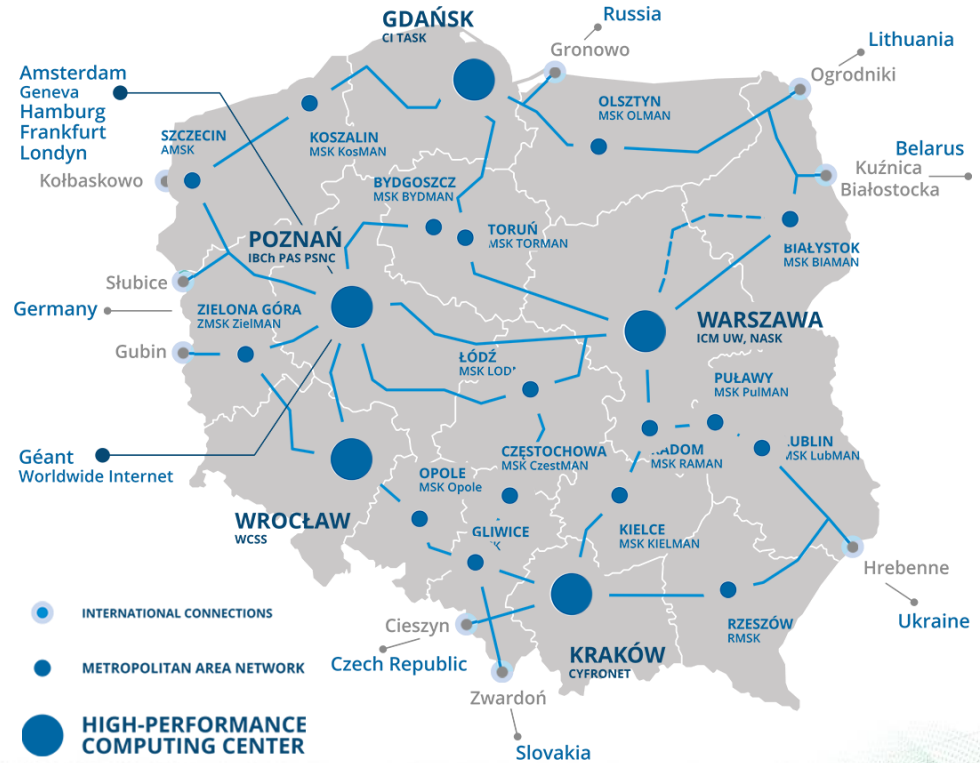
- Effective use of large data volumes in business
- Integration of advanced Big Data, AI and ML solutions
- Support for small and medium-sized enterprises

- **Digital Skills & Education**
- **Next Generation Media**
- **Multiscale Simulations**
- **Time & Frequency Distributions**
- **Exascale HPC**
- **LOFAR/POLFAR**
- **Digital Libraries**
- **Big Data**
- **Cybersecurity**

PIONIER Consortium was established in 2003 and includes the PIONIER **fiber optic network**, which is one of the most modern in the world. It is a key component of the IT infrastructure of science in Poland and is part of the **European Research Area**.

IT infrastructure, including **access to high-power computing**, is a condition of development for many fields of science. Since the beginning of its existence, PIONIER is an active partner of scientific teams from many fields of activity.

PIONIER network is evolving **towards terabit bandwidths**, offering services to support digital innovation.



- **PSNC** - Poznan Supercomputing and Networking Center, Institute of Bioorganic Chemistry PAS
- **Academic City Computer Network**, West Pomeranian University of Technology, Szczecin
- **CI TASK** Information Centre, Gdansk University of Technology
- **CYFRONET AGH** University of Science and Technology, Cracow
- **CZESTMAN** Częstochowa University of Technology
- **ICM** University of Warsaw
- **KIELMAN** University of Technology, Kielce
- **KOSMAN** Koszalin University of Technology
- **LODMAN** Lodz University of Technology
- **LUBMAN** Maria Curie-Skłodowska University, Lublin
- **NASK** National Research Institute, Warsaw



- **OLMAN** Municipal Computer Network Olsztyn
- **BIAMAN** Białystok University of Technology
- **Silesian Academic Computer Network**, Silesian University of Technology, Gliwice
- **PULMAN** Institute of Soil Science and Plant Cultivation, Puławy
- **RAMAN** Municipal Computer Network, Radom
- **Rzeszow City Computer Network**, Rzeszow University of Technology
- **TORMAN** Nicolaus Copernicus University, Toruń
- **MAN-OPOLE** Municipal Computer Network
- **BYDMAN** Bydgoszcz University of Technology
- **WCSS** Wrocław Centre for Networking and Supercomputing, Wrocław University of Technology
- **ZIELMAN** University of Zielona Góra

OLMAN

Politechnika Białostocka



Politechnika Śląska

PulMAN

RAMAN
Radomska Sieć Komputerowa



TORMAN



WCSS

zielMAN
Zielonogórska Miejska Sieć Komputerowa

PIONIER Consortium Polish Optical Internet

Poznan Supercomputing and Networking Center
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**POZNAN SUPERCOMPUTING
AND NETWORKING CENTER**



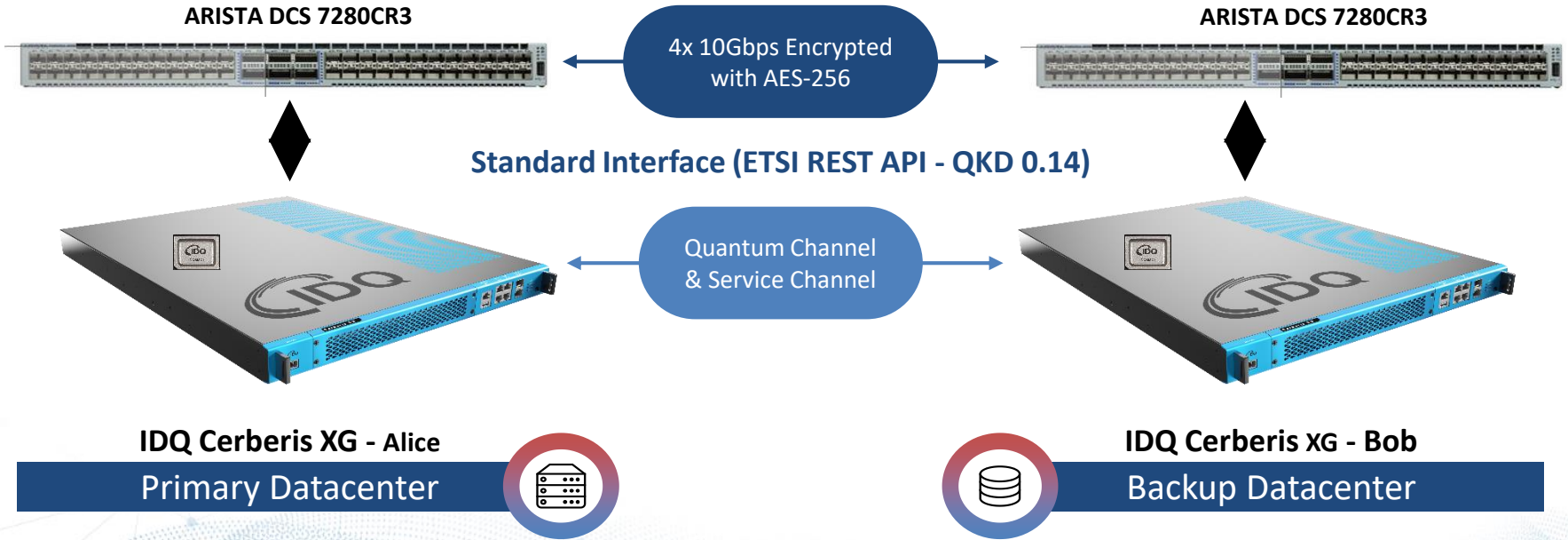
Where Innovation Is Everyday

SC22 Conference, Dallas, USA, November 14-17, 2022

MACsec protocol and Quantum Key Distribution integration in operational environment and devices

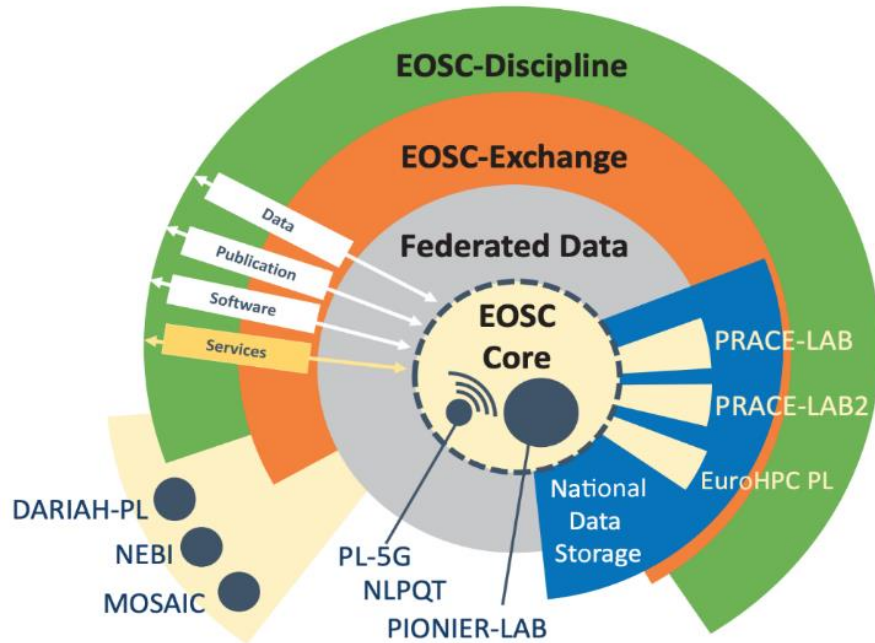
- Live IDQ QKD system operation together with ARISTA networking equipment
- Example of ETSI GS 014 QKD protocol implementation
- QKD keys integrated with MACsec system
- MACsec keys rotated using external QKD keys
- Possibility to work with all QKD devices that use ETSI 014 interface

Quantum-Safe communication solution



- National HPC infrastructure and services for scientific applications
- Cloud on demand for industry
- Big data analysis
- Monitoring of resources
- Platform for peer review process
- Platform for user handling and services customisation





EUROPEAN OPEN SCIENCE CLOUD

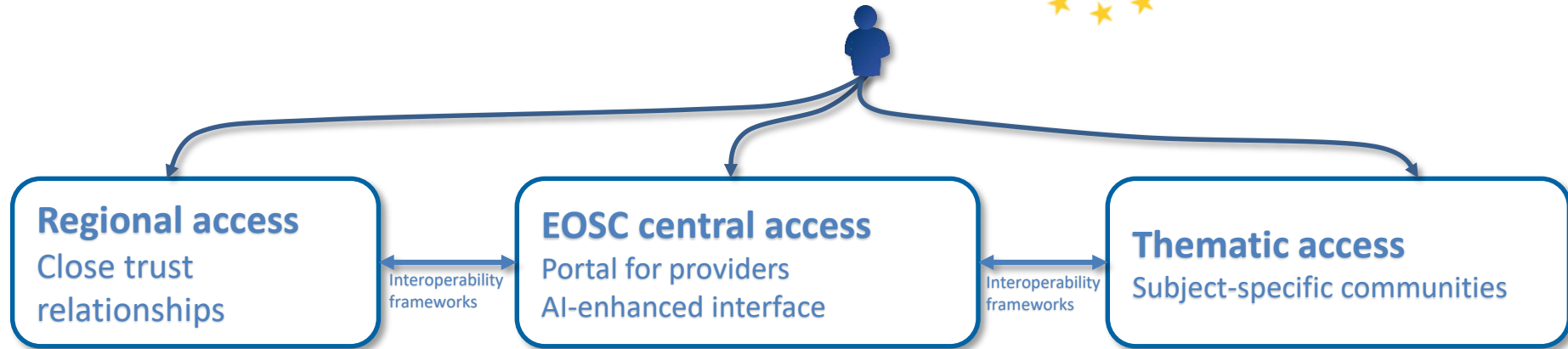
The European Open Science Cloud (EOSC) is an **environment for hosting and processing research data** to support EU science.

The ambition of EOSC is to provide European researchers, innovators, companies and citizens with a **federated and open multi-disciplinary environment** where they can publish, find and re-use data, tools and services for **research, innovation and educational purposes**.

EOSC Implementation – federated approach



**EUROPEAN OPEN
SCIENCE CLOUD**





IBM Quantum Hub

PSNC to Join IBM Quantum Network - First Hub in Central and Eastern Europe



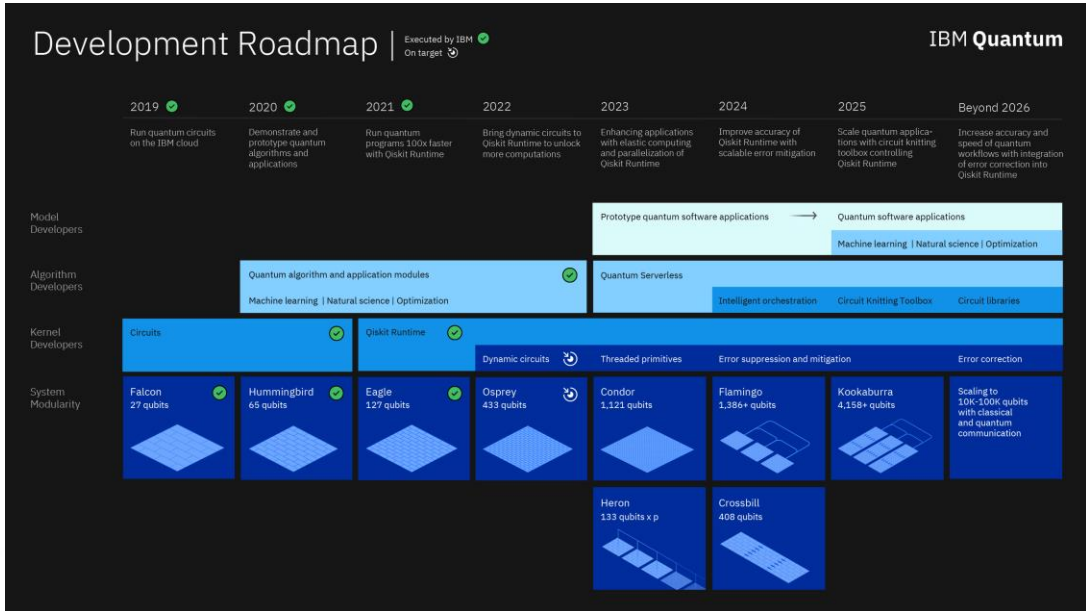
IBM Quantum is an industry-first initiative to build universal quantum systems for **business and science applications**.

By working with IBM, PSNC joins more than **170 IBM Quantum Network members**, including Fortune 500 companies, start-ups, academic institutions and research labs, all working to advance quantum computing and explore practical applications.





PSNC to Join IBM Quantum Network First Hub in Central and Eastern Europe



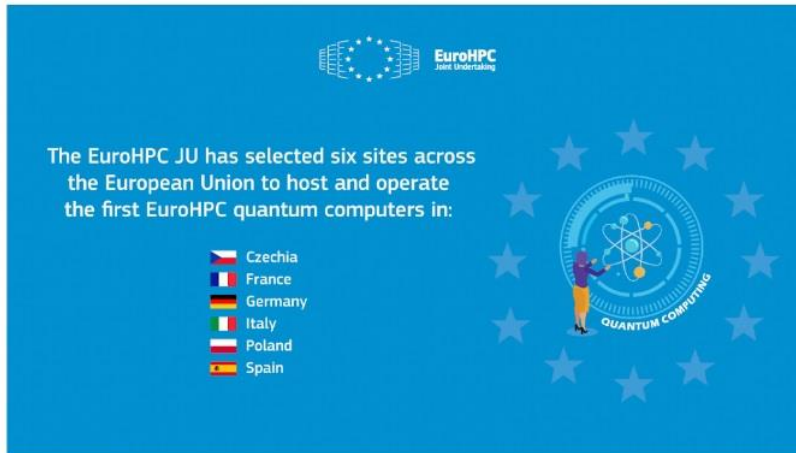
PSNC joined the **IBM Quantum Network**, to explore the development of **quantum computing applications** including **advancing artificial intelligence solutions, space technologies, metrology and crisis modeling.**

IBM Quantum Network members have access to IBM's quantum computing systems, including IBM's recently **announced 127 qubit processor**, 'Eagle', as well as to IBM's quantum expertise and Qiskit, the leading open-source quantum software development kit.

PSNC is Hosting a Quantum Machine as a part of EuroHPC

Selection of **six sites to host the first European quantum computers**

The European High Performance Computing Joint Undertaking (EuroHPC JU) has selected six sites across the European Union (EU) to host and operate the first EuroHPC quantum computers: Czechia, Germany, Spain, France, Italy, and Poland.



- R&D Purpose
- Available to EU users in scientific communities, industry and the public sector
- To help develop Q applications

https://eurohpc-ju.europa.eu/selection-six-sites-host-first-european-quantum-computers-2022-10-04_en

AI4Youth

The AI4Youth logo consists of a blue, stylized icon resembling a leaf or a drop with a small red square at its tip, followed by the text 'AI4Youth' in a blue, sans-serif font.

The pilot educational project for general secondary schools is implemented by the Consortium of the **PSNC IBCh PAS** and the **Software Development Academy** operating for the Ministry of Development and Technology.

It is based on Intel's global program aimed at increasing digital awareness, especially in the field of **artificial intelligence**, and promoting the competences of the future among young people.



eDWIN project

- A national IT platform for integrated plant protection
- Improvement of quality of food production in Poland
- Supports implementation of EU directives on integrated pest management:
- Collaboration with other regional advisory centers in Poland and other partners, including Institute of Plant Protection, Agricultural Advisory Centre
- Build or integrated over 550 agrometeo stations and 20 phenological observations stations

Platform offers 4 e-services

- Virtual farm
- Tracing the origin of agricultural products and plant protection products used
- Risk reporting
- Sharing of meteorological data



DEMETER Pollination Optimization Service and Farm Benchmarking

- Calculation of pollination needs for **eDWIN** farmers
- Facilitates invitation of beekeepers with mobile apiaries to improve pollination of the farms
- Informs local beekeepers about usage of pesticides
- Make use of DEMETER Agriculture Information Model to exchange data between the pollination service and the farm management system
- To support the monitoring of bee welfare, beekeepers can use several dedicated IoT platforms, oT platforms monitor conditions such as temperature, weight, position and sound

Benchmarking at farm level decision support system

- Integration of benchmarking services within eDWIN
- Provides more data and support for farmers in providing information about economic status of the farm
- Compares with regional information about similar farms (size, produce) collected by European FADN



Demeter is a Horizon 2020 project (857202) supported by the European Union.

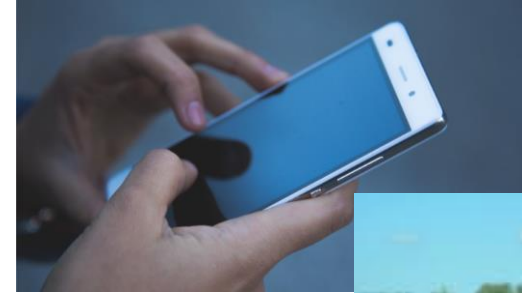
AI4EOSC Plant protection use case

Currently: WODR and PSNC operate a national advisory platform for farmers (eDWIN), which includes a network of meteorological ground stations, the Farm Management System, and ground observations of the occurrence of diseases and pests. The current solutions are based on predictive mathematical models.

Within AI4EOSC: The plan is to add to the current mathematical prediction models the ML/DL-based models used for recognition of the plant diseases and add new sources of the data. Initial focus on wheat and sugar beets and detection of the fungal diseases.

AI4 |  EOSC

Artificial Intelligence for the #EOSC



Funded by
the European Union

POZNAN SUPERCOMPUTING AND NETWORKING CENTER



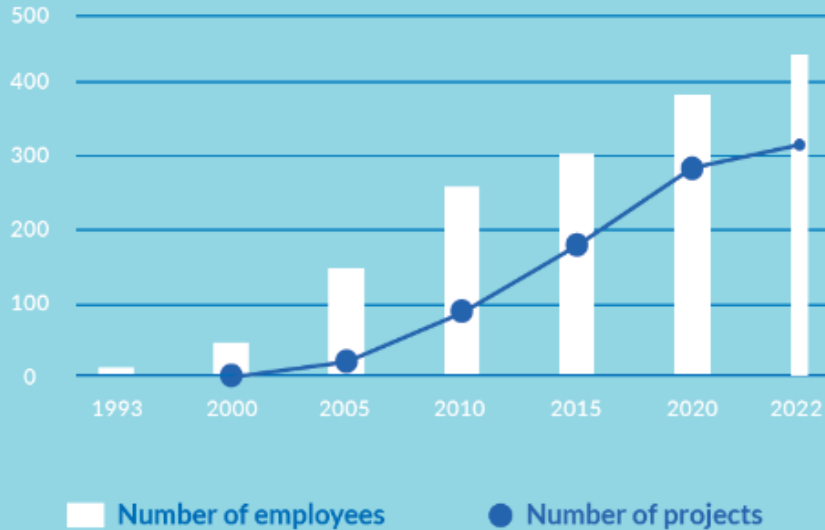
Institute of Bioorganic Chemistry PAS
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PSNC In Numbers

PSNC in numbers

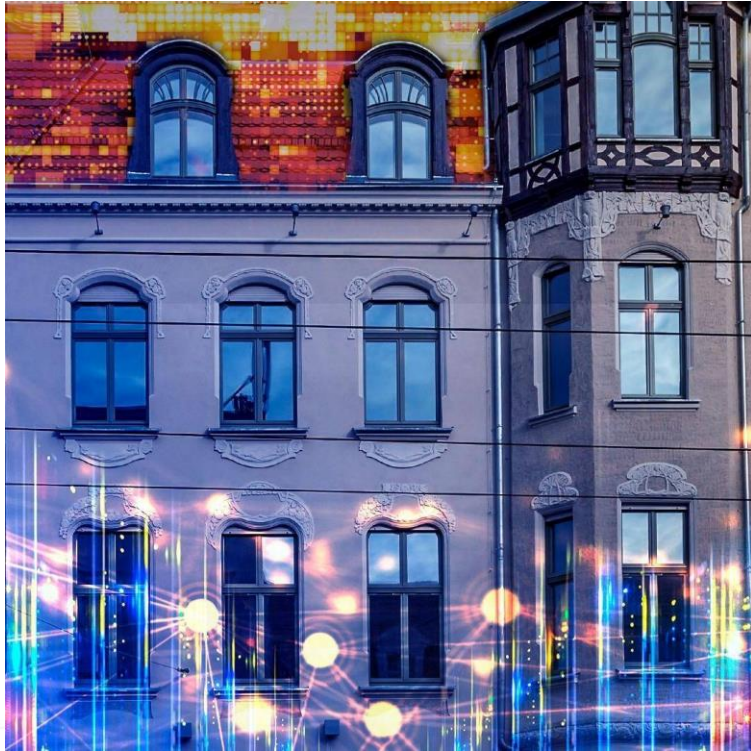


Our Mission Is To Advance Science

- **29 years of activity**
- **1.34M scientific users**
- **449 employees**
- **301 projects**
- **20 laboratories**



FUTURE LABS



FUTURE LABS

The PSNC living lab space welcomes citizens and other stakeholders to co-design innovations. This **120-year-old building** has been retrofitted with cutting edge facilities for **prototyping and experimentation**.

The Future Labs space hosts interdisciplinary events that inspire collaborations in the areas of **Smart City, Healthcare, Industry 4.0, Art & Science, Education, Gaming and Coworking**.



FUTURE LABS

PSNC Future Labs has over **2000 m2** on **six floors**. It is a **living laboratory**, i.e. spaces equipped with the modern ICT devices, where Poznan **companies and organizations** are able to test or demonstrate innovative solutions.

It is a **pre-incubator of services, undertakings and projects**, providing access to living labs in the **“proof-of-concept” methodology**, applying mechanisms of user satisfaction testing.



AERO SPACE LAB

Situated 58 km from the center of Poznan, this site will soon see the construction of the **Aerosfera Digital Airport** with a view to carrying out research and development work in applications of unmanned aerial vehicles and flight control.

AERO SPACE LAB



The following key priorities and areas for conducting R&D activities in the Aerospace Lab located remotely at the Kakolewo Airport (EPPG):

- U-Space and urban mobility
- Connected and automated ATM/UTM
- AI & Big Data for Aviation 4.0
- Virtualization and cyber-secure data sharing for remote systems
- Air-ground integration and streamlined cyber-physical systems autonomy
- 5G and edge computing