



Distributed National HPC and Data infrastructure

Norbert Meyer, PhD



PRACE-LAB

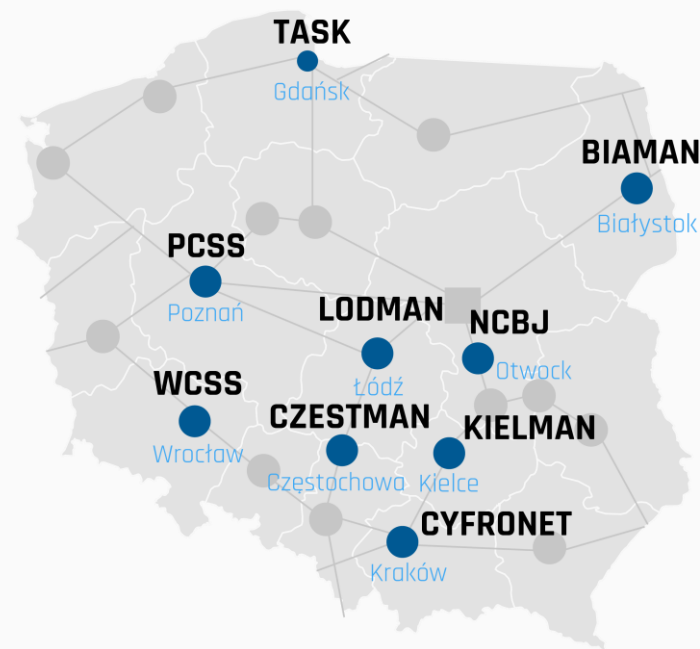
- Duration: 2018 - 2023
- Project number: POIR.04.02.00-00-B001 / 18
- Assigned by the Ministry of Science and Higher Education
- Budget: 50 MEuro
- **Inkind contribution from Science and Industry (+20 %)**



PRACE-LAB

Project participants:

- Institute of Bioorganic Chemistry of the Polish Academy of Sciences - Poznań Supercomputing and Networking Center
- Academic Computer Center CYFRONET AGH
- Białystok University of Technology
- Częstochowa University of Technology
- Gdańsk University of Technology CI TASK
- Lodz University of Technology
- Kielce University of Technology
- Wrocław University of Technology - Wrocław Center for Networking and Supercomputing



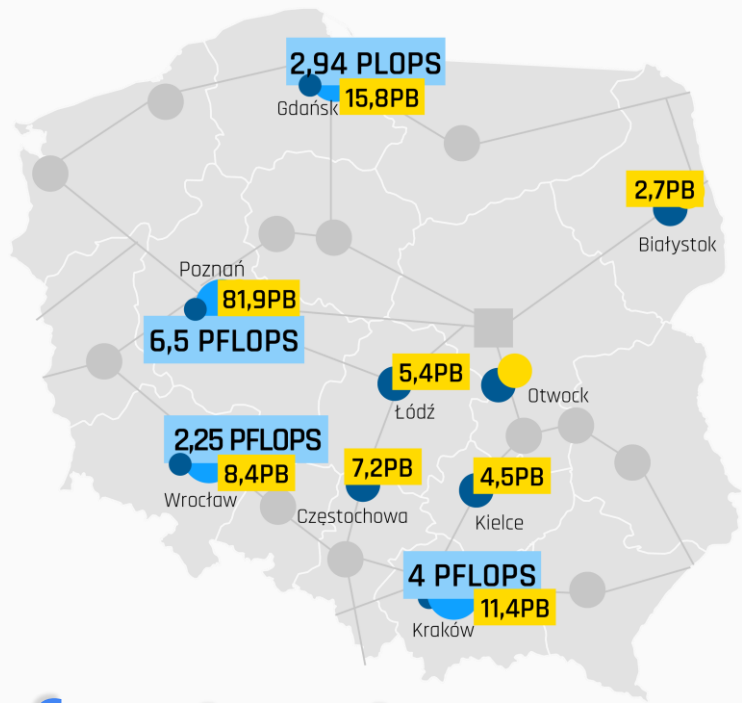
PRACE-LAB

HPC+cloud in Poland for Europe

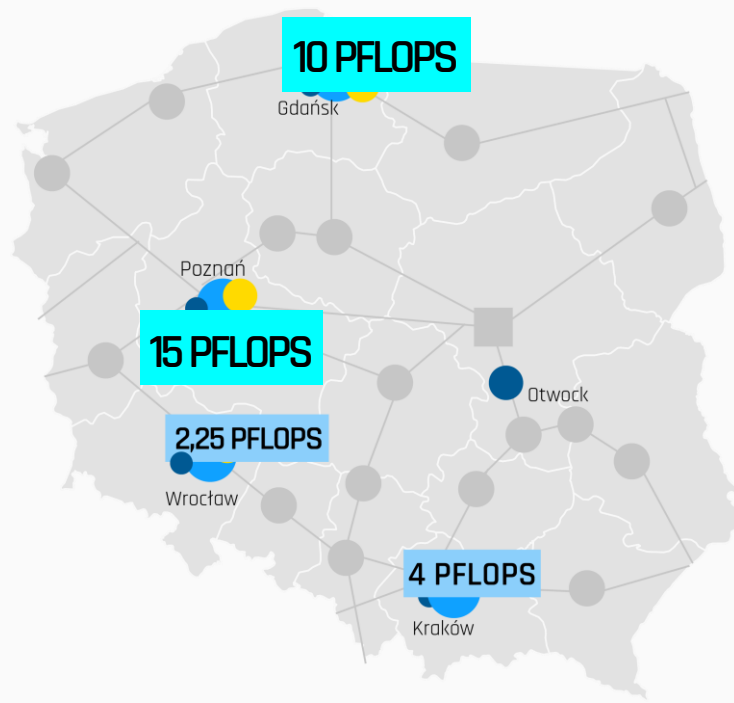


- The **main goal of the project** is to increase the competitiveness of the scientific community and the industry, with particular emphasis on SMEs, on international markets.
- The Project aims to improve the position of the Polish ICT sector by supporting the development of innovative solutions.
- The immediate goal is to build a widely available HPC computing infrastructure consisting of high-performance computing servers, specialized processing units and flexible data management systems, and to provide scientific units and enterprises services for research and development and commercial activities based on this infrastructure.

 **pracelab**



pracelab 



Infrastructure

Infrastructure



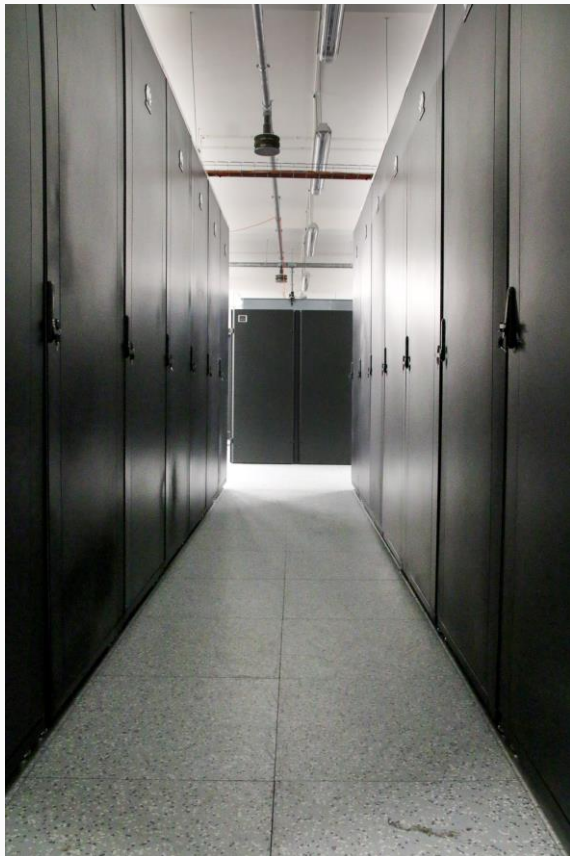
- Over 3,200 nodes
- Over 15.5 PFLOPS of HPC
- Over 63 PB of data capacity
- Over 21 PB of data server capacity in MAN units (city networks)
- ETHERNET and INFINIBAND networks
- OpenStack, Ansible, SDN

Supercomputer Altair

- Conventional power – 1320 2-processor nodes based on Intel Xeon Platinum 8268
- Accelerators – 9 nodes equipped with 8 NVIDIA V100 GPU cards
- TOP500 list
- 61st on the GREEN500 list



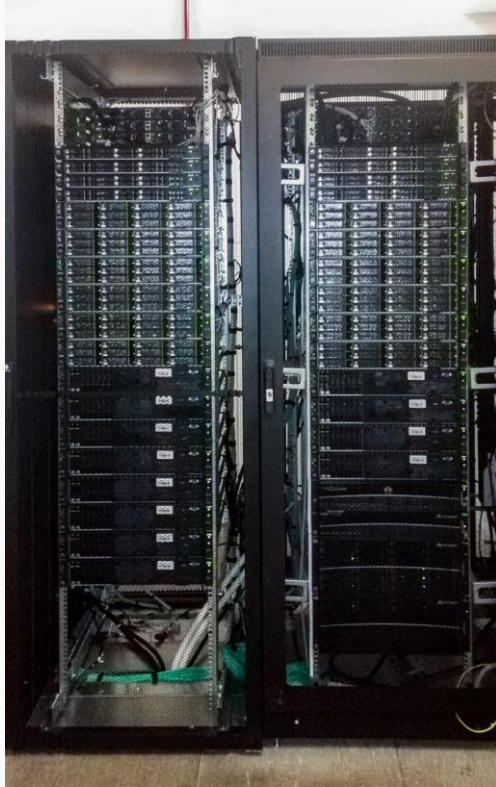
Ares - Cyfronet AGH



- Parallel HPC processing
- Virtual servers
- Software and application virtual laboratories – SaaS
- Data storage for virtual environments
- Backup and long-term data archiving

Photo: Cyfronet AGH, by Integrale IT

Data Infrastructure – Universities



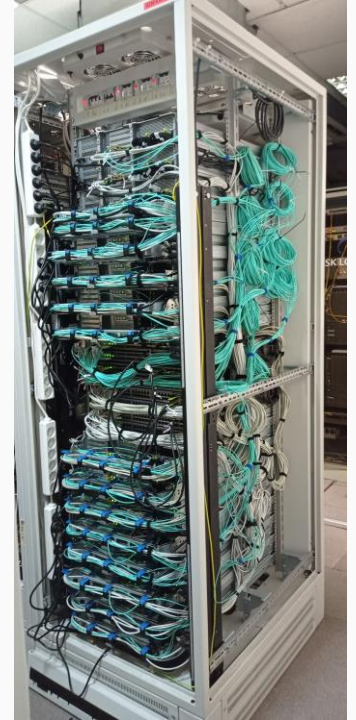
Białystok University of Technology



Częstochowa University of Technology



Technical University of
Łódź



Commercial part



- **40% of infrastructure,**
- enterprises, SMEs, R&D, central and local government administration,
- Industry 4.0, automotive, security, power engineering, medicine, agriculture and bioinformatics, etc.,
- CFD and MES simulations, Big Data processing and analysis (including elements of AI), optimization of business and production processes based on sensory data (IoT) and support for designing and testing new and / or improved products and services.

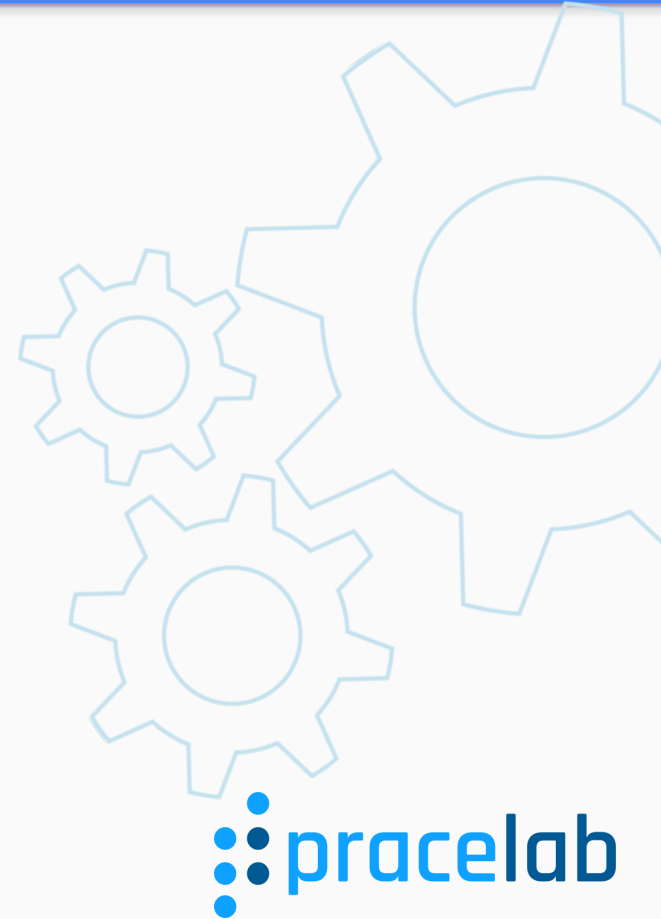
Scientific part



- **60% of infrastructure,**
- R&D at universities, institutes of the Polish Academy of Sciences and National Research Institutes,
- physics, computational biology and chemistry, bioengineering, nuclear physics, astrophysics, mathematics, climate change, humanities, etc..
- New methods of model optimization for selected AI / ML tools for different hardware architectures.

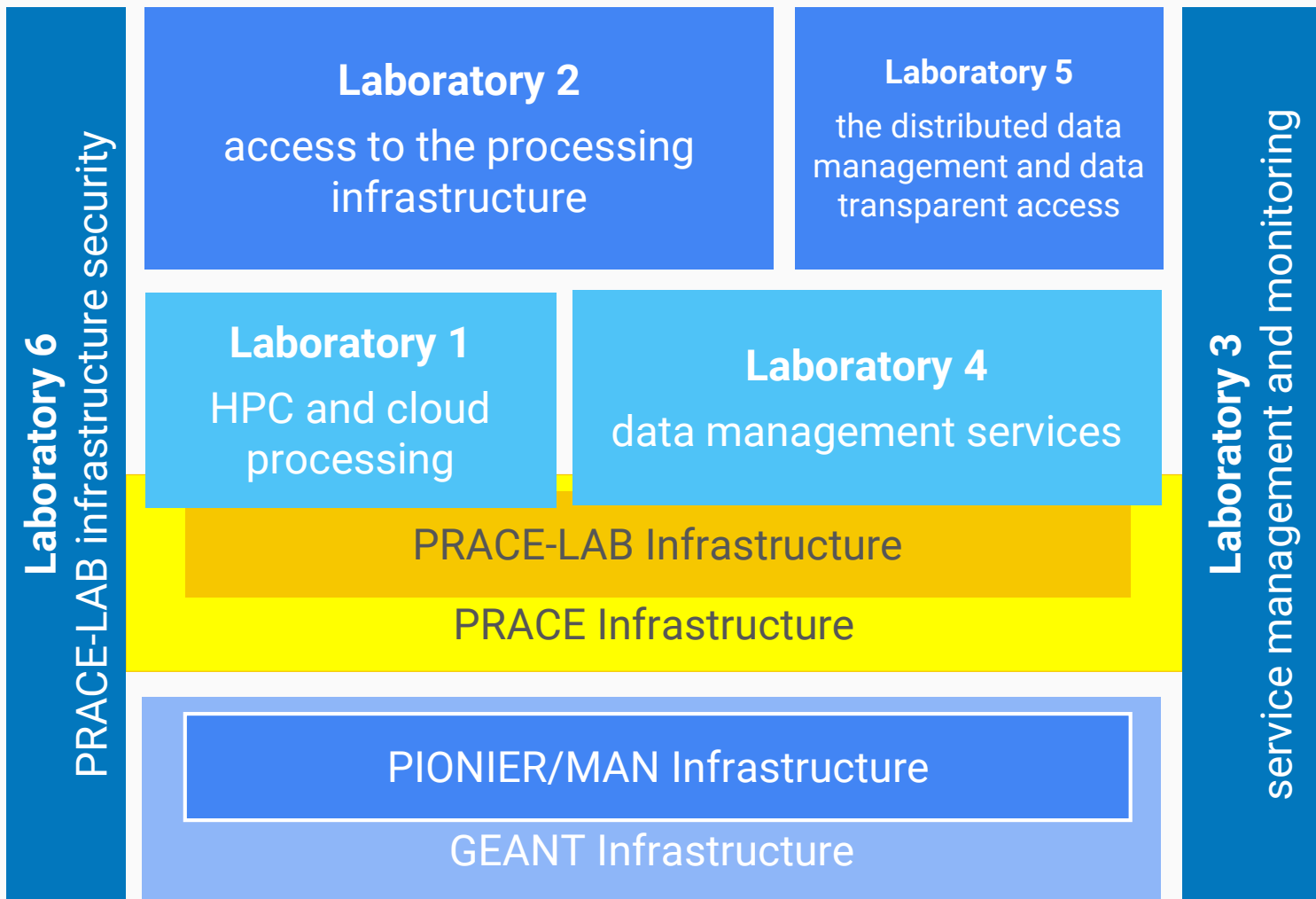
Services

- Computing - HPC, cloud
- Software and application virtual laboratories – SaaS
- Data storage for virtual environments
- Backup and long-term data archiving
- Replicated data storage
- Data Sync and Sharing Service (Seafile)
- Resource monitoring and collocation
- Distributed data management and transparent access
- Security audits of services and organizations
- Cryptographic protection of cloud's data
- Data center heat energy recovery

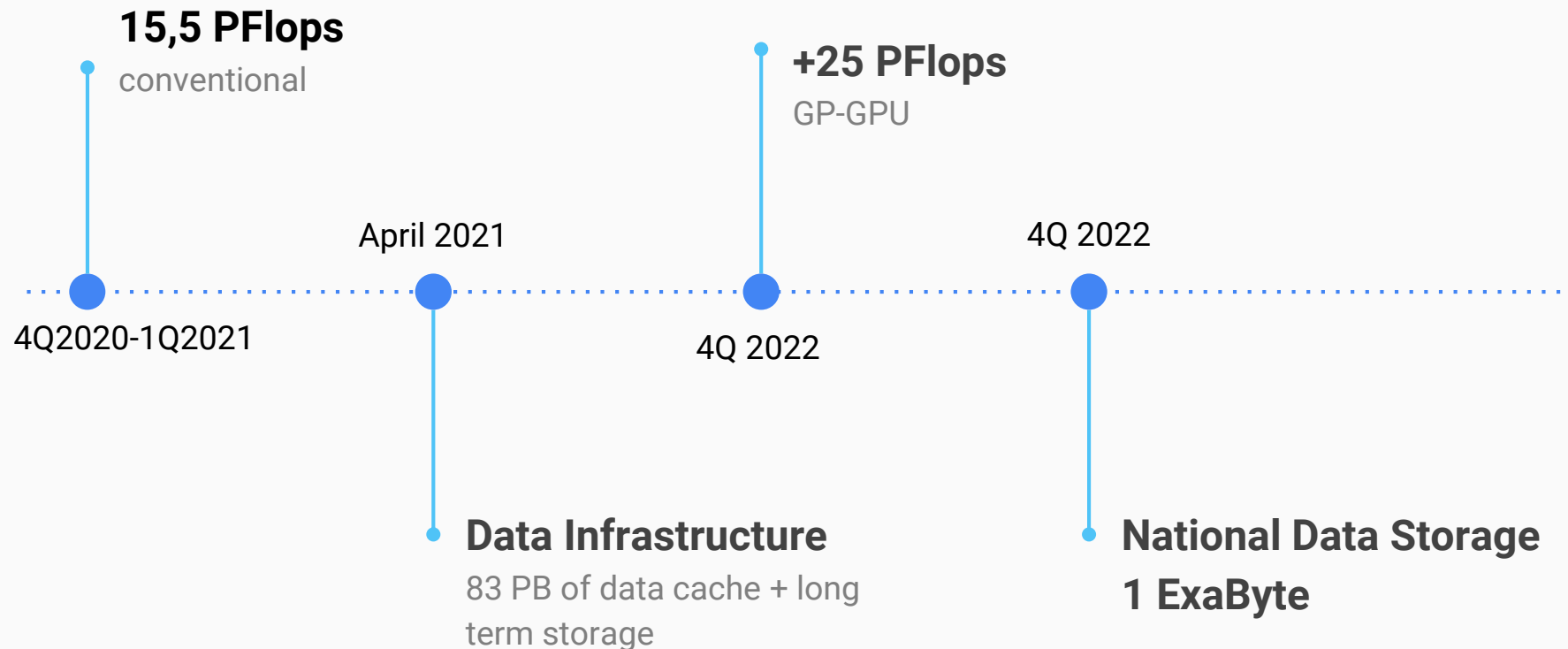


Laboratories in PRACE-LAB

- **Laboratory HPC and cloud processing**
- Laboratory of access to the processing infrastructure
- Laboratory of service management and monitoring
- **Laboratory of data management services**
- Laboratory of the distributed data management and data transparent access
- Laboratory of PRACE-LAB infrastructure security



HPC infrastructure timeline



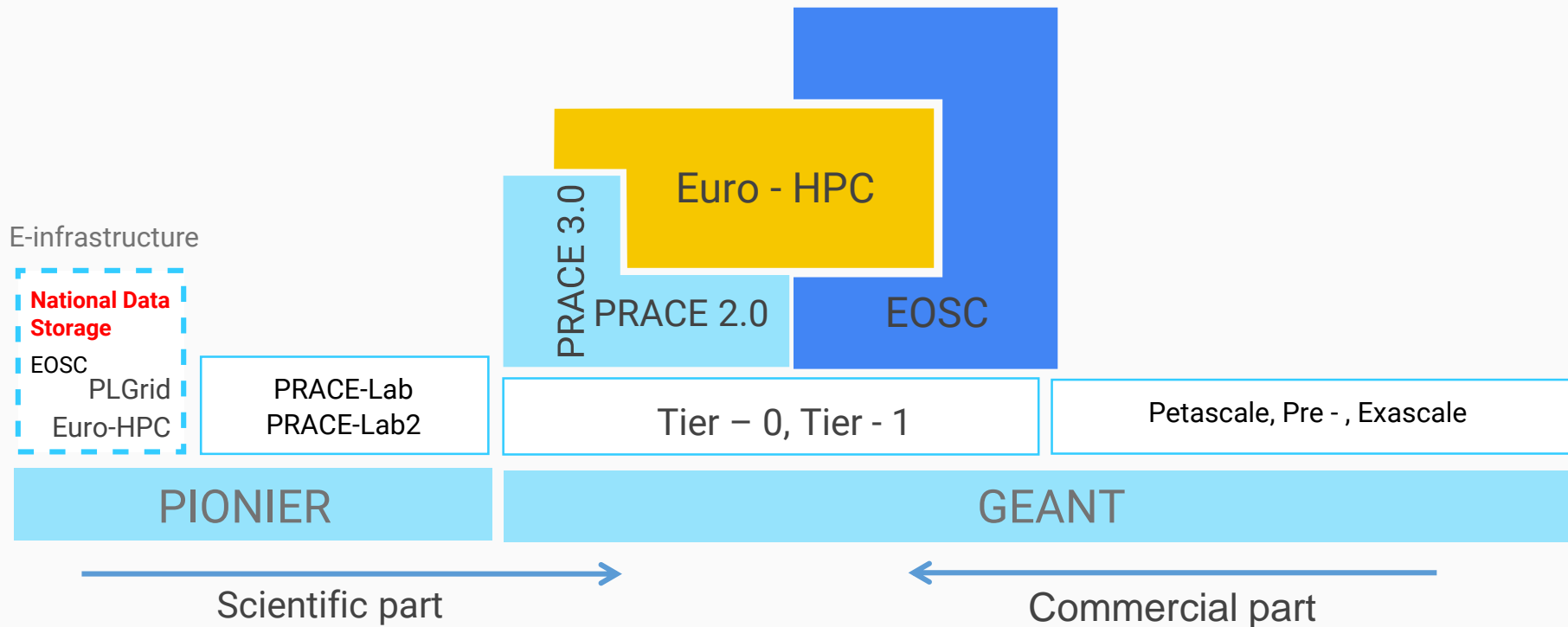
Research and development

Polish Roadmap of Research Infrastructure

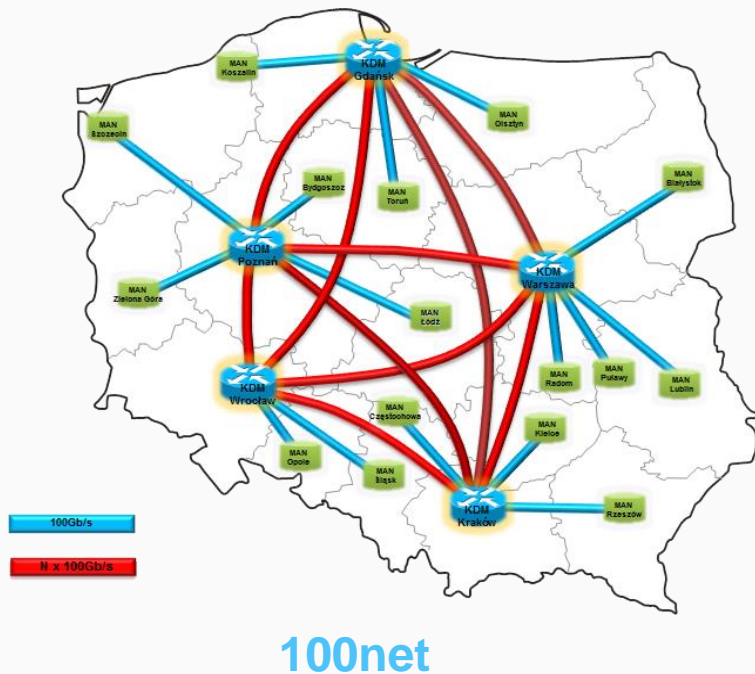
ESFRI

Applications

Centers of Excellence (Hildago, EoCoE,
EoCoE II, Coegss), Deep, Lofar,
EOSC-HUB, EOSC- Synergy



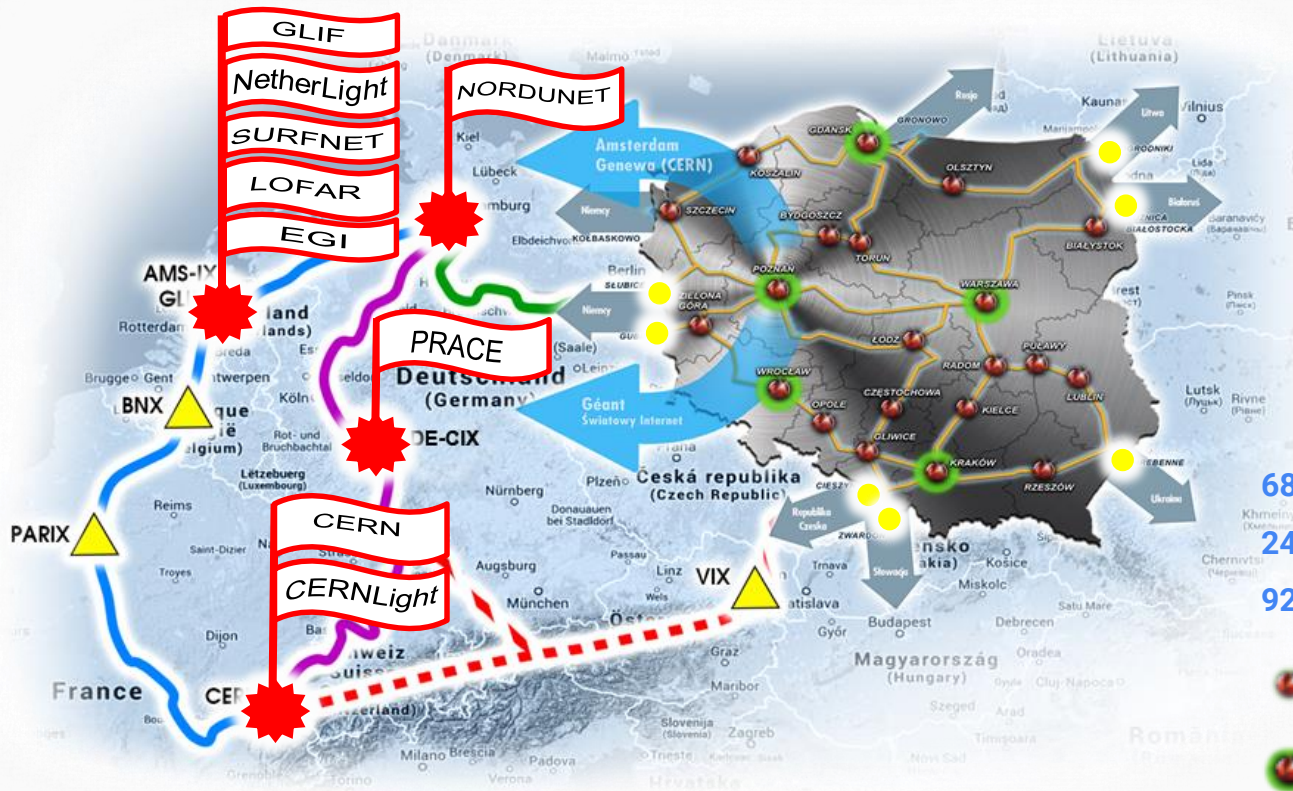
Networking



- 400Gb/s connection between Poznan and Warsaw
- $n \times 100\text{Gb/s}$ between all HPC Centers
- High reliability and automatic reconfiguration of the optical network in the national dimension
- 100Gb/s link from MANs
- Distributed lab for future HPC tools and algorithms
- Deployment of PSNC's QCG software stack

Dedicated network "100net" connecting Polish HPC Centers

Pan-European backbone of PIONIER network



6824 km of fiber infrastructure in Poland

2454 km of fiber in Europe (IRU)

9278 km of fiber in total

 **Metropolitan Area Network (MAN)**

MAN + HPC Center

Thank you

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