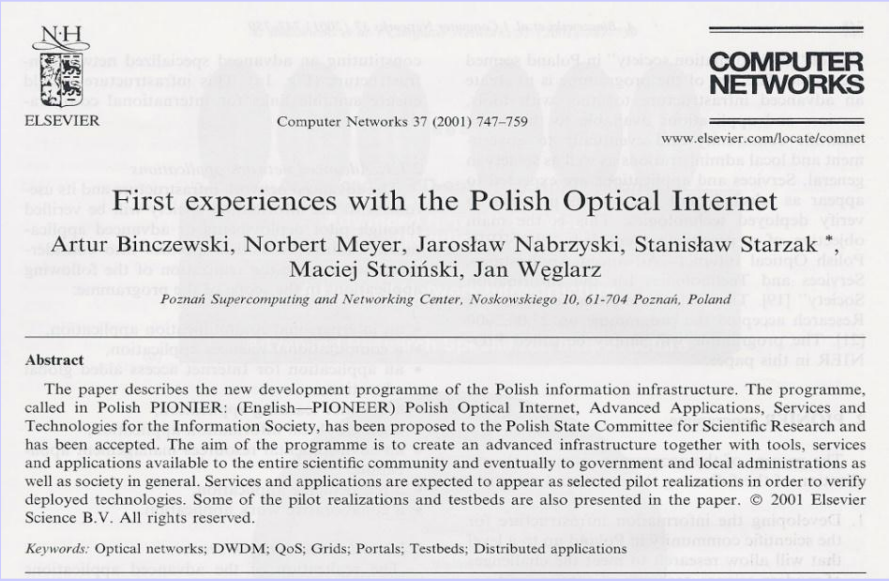
PIONIER – the national fibre optic network for new generation services

Artur Binczewski, Maciej Stroiński
Poznań Supercomputing and Networking Center

e-IRG Workshop
October 12 - 13, 2011; Poznań, Poland

18th years of Polish e-Infrastructure for Science

- 1993 – starting academic MANs based on own fibers (FDDI)
- 1995 – MANs' transition to ATM
- 1997 – POL-34, 155, 622
- 1999 – joining to TEN-155 (precursor of GÉANT) network
- 2000 – PIONIER take-of
- 2001 – dark fiber deployment & 1st EU funded project: ATRIUM
- 2003 – 10GE
- 2004 – multi-lambda
- 2006 – PIONIER2 strategy
- 2008 – PLATON project
- 2009 – NEWMAN project
- 2011 – 100NET project



ELSEVIER

Computer Networks 37 (2001) 747–759

COMPUTER NETWORKS

www.elsevier.com/locate/comnet

First experiences with the Polish Optical Internet

Artur Binczewski, Norbert Meyer, Jarosław Nabrzyski, Stanisław Starzak *, Maciej Stroiński, Jan Węglarz

Poznań Supercomputing and Networking Center, Noskowskiego 10, 61-704 Poznań, Poland

Abstract

The paper describes the new development programme of the Polish information infrastructure. The programme, called in Polish PIONIER: (English—PIONEER) Polish Optical Internet, Advanced Applications, Services and Technologies for the Information Society, has been proposed to the Polish State Committee for Scientific Research and has been accepted. The aim of the programme is to create an advanced infrastructure together with tools, services and applications available to the entire scientific community and eventually to government and local administrations as well as society in general. Services and applications are expected to appear as selected pilot realizations in order to verify deployed technologies. Some of the pilot realizations and testbeds are also presented in the paper. © 2001 Elsevier Science B.V. All rights reserved.

Keywords: Optical networks; DWDM; QoS; Grids; Portals; Testbeds; Distributed applications

National Research and Education Network - PIONIER (topology)

Area	312k sq km
Population	38M
Main academic centers	21
State universities	165+
Researchers & Students	2M+
R&D institutions and Univ. interconnected via PIONIER network	700+

6494 km of fiber infrastructure in Poland

763 km of fiber in Germany (IRU)

7257 km of fiber in total

21 MANs and 5 HPC Centers in PIONIER Consortium with PSNC as Operator

National Research and Education Network - PIONIER (3Q2011)

NEWMAN Project
Advanced MPLS/IP and DWDM platform

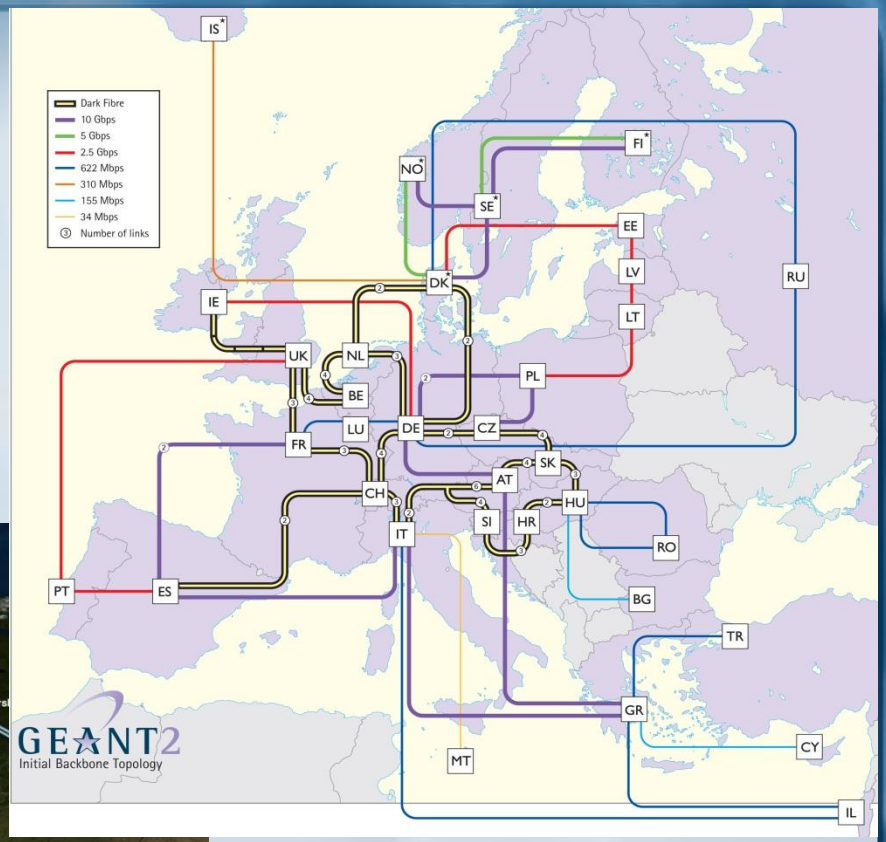
- Project co-funded from EU structural grant
- Nation scale deployment of MPLS/IP platform for all MANs and PIONIER
  - Last mile is provided for most of end users
  - Full portoflio of offered services: IPV4, IPv6, MPLS, VPLS, multicasts, QoS,…
- New generation DWDM with automatic restoration (GMPLS)
  - 100G ready
  - Colorless, Directionless and Contentionless functions implemented
  - All nodes support p2p 10G transmission without regeneration

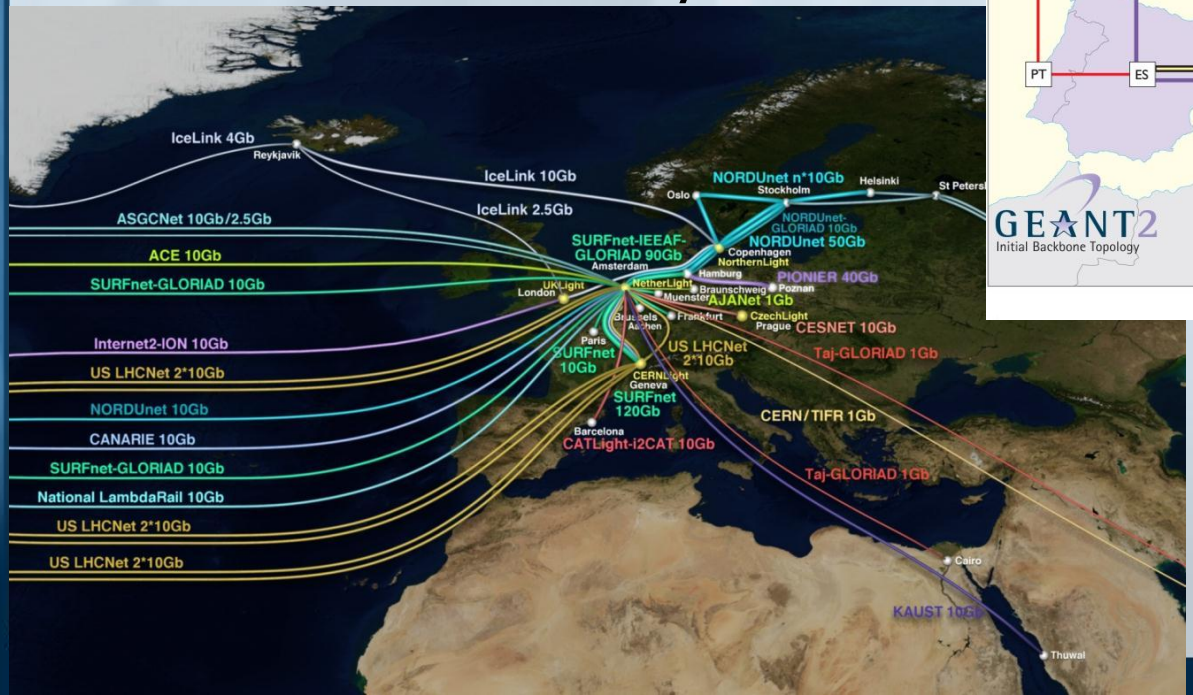
MPLS/IP platform	
Core switches	191
Access switches	365
10 GE interfaces	4 416
1 GE interfaces	21 680

DWDM platform	
nodes	79
ROADMs	143
10GE interfaces	396

International connectivity

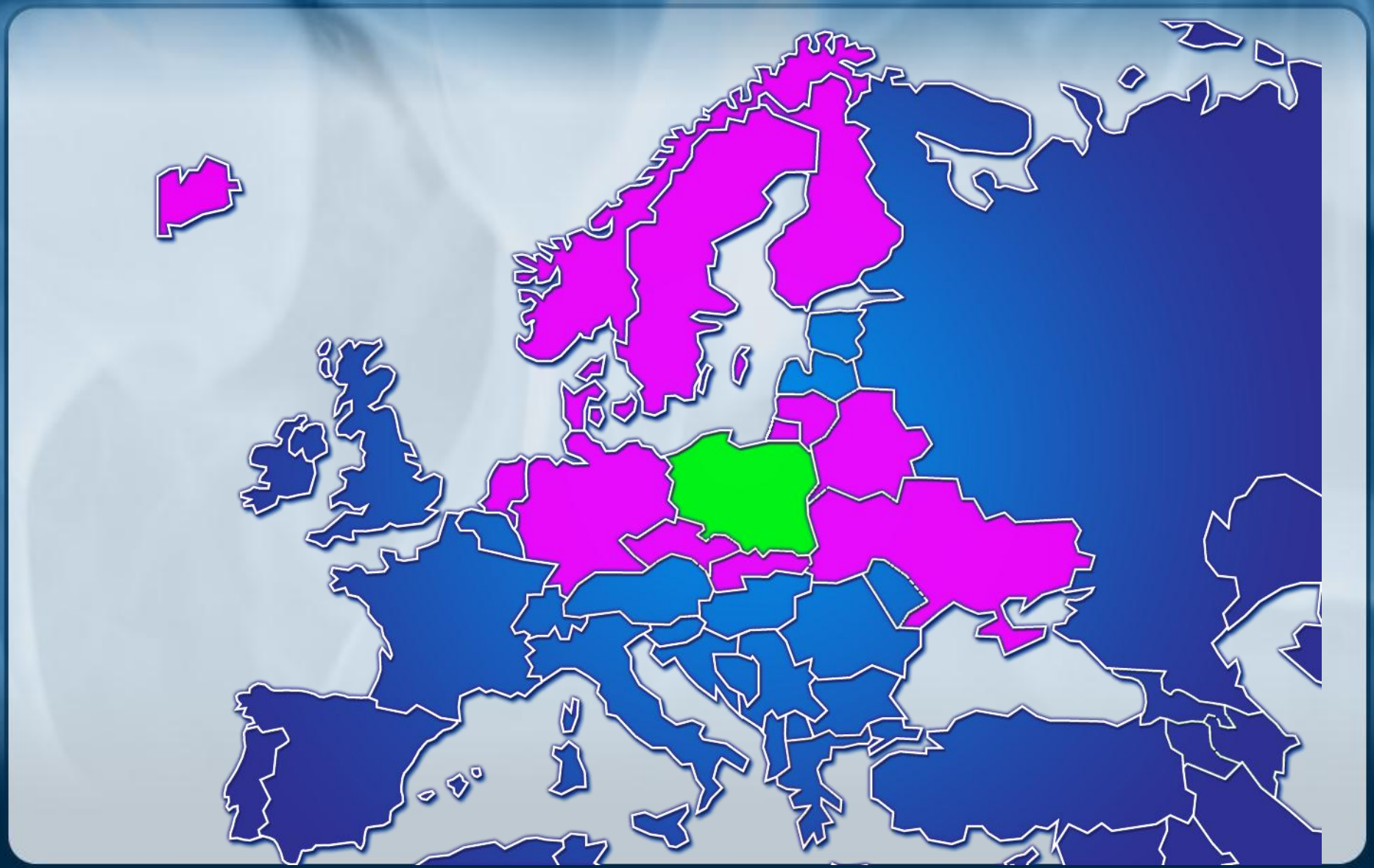
- GÉANT network
- GLIF
- Cross Border Dark Fiber
- Access to IXP
- Access to Commodity Internet





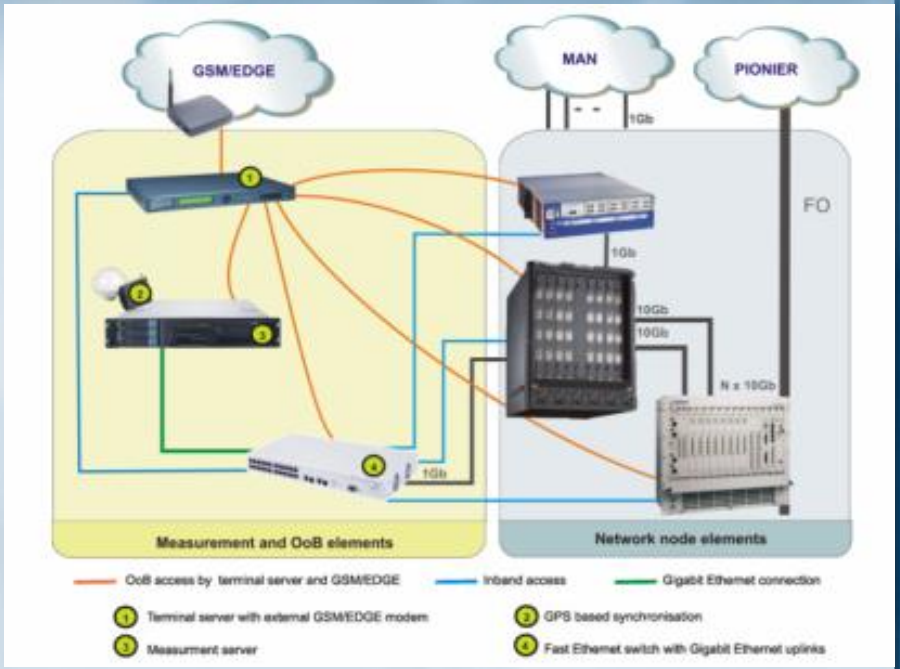
Cross Border Dark Fiber connectivity

CBDF – Effects



Network Operation Center

- Operate 24 / 7 / 365
- 2 Network Operation Centers
  - Poznan
  - Lodz
- Out-of-band management
- Monitoring facilities
- Portfolio of measurement equipment



Result: 99,99% reliability

Example of research project (1)

Radioastronomy

- Dedicated connections for project

  E-VLBI/EXPReS

  1 Gb/s (on10 Gb/s channel)
  10 Gb/s (from 2012)

- Next project in near future

  POLFAR

  3 Gb/s (in initial phase)
  10 Gb/s (in next period)

Example of research project (2)

High Energy Physics

- Dedicated connections

CURRENTLY

1 Gbps (on 10 Gbps channel)

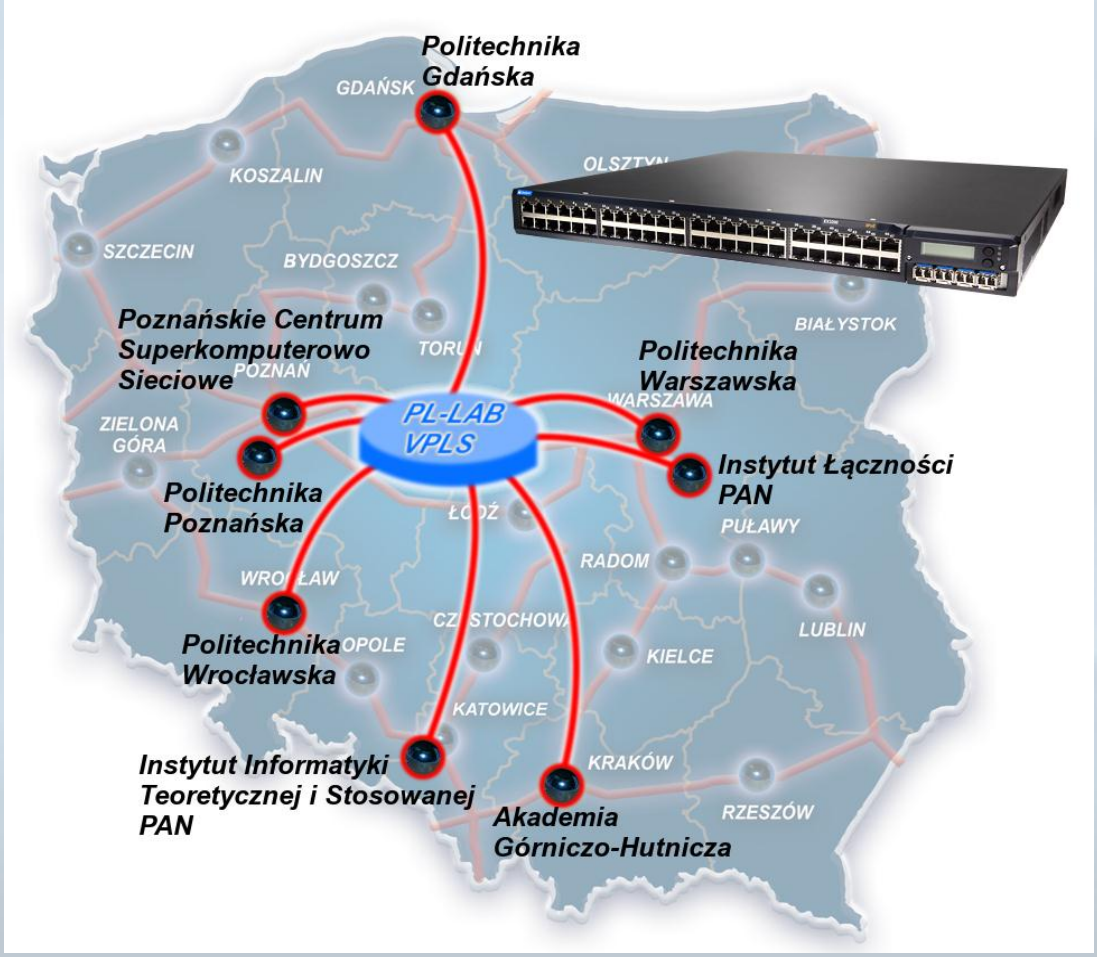
IN FUTURE (2015)

100 Gbps – 1 Tbps

Example of research project (3)

Future Internet Engineering

- Dedicated connections
- PL-LAB network connects 8 distributed labs in Poland



CURRENTLY

1 Gbps VPLS network

NEXT YEAR (2012)

Dedicated lambdas 10 Gbps

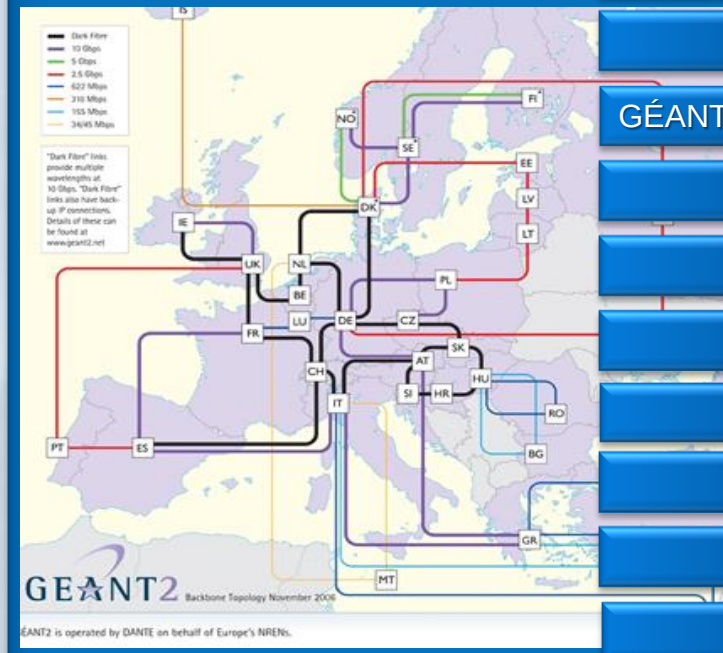
GRIDs projects

- DORII
- Chemomentum
- RINgrid
- GridLab
- CrossGrid
- EUFORIA
- PRACE
- HPC Europa I/II
- EGEE I/II/III
- BalticGrid
- int.eu.grid
- InteliGrid
- OMII_Europe
- g-Eclipse
- QosCos Grid
- ACGT
- ViroLab
- EuroGrid

GRID INFRASTRUCTURE

PROGRESS,
SGI GRID, CLUSTERIX,
KMD, PL-GRID, POWIEW

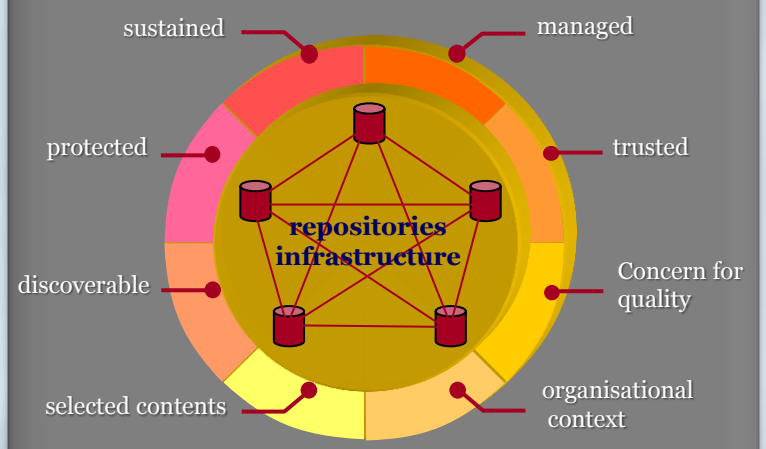
Network projects

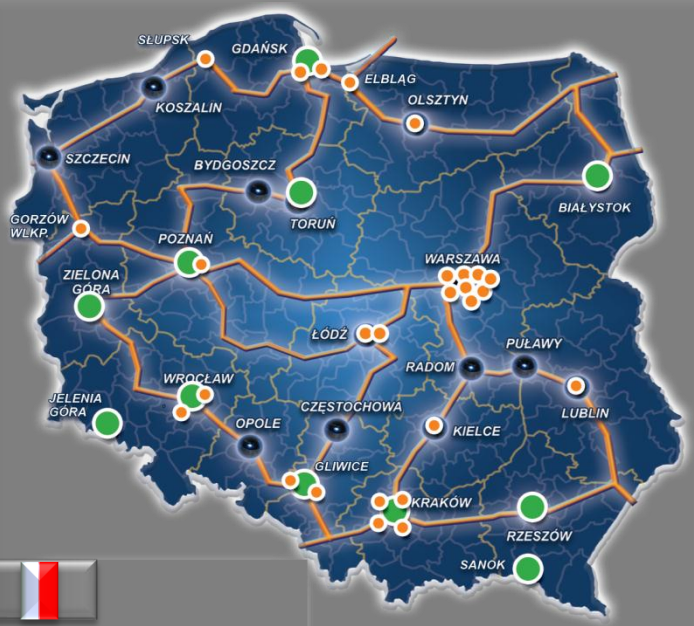


- Phosphorus
- Porta Optica
- FEDERICA
- GÉANT/ GÉANT2/ GÉANT3
- EMANICS
- MUPBED
- 6NET
- 6WINIT
- SEQUIN
- Atrium
- EuQos
- Geysers
- Novi

PLATON, NEWMAN, FUTURE INTERNET ENGINEERING

Scientific Data Layer projects





EuropeanaLocal

ENRICH

CACAO

DRIVER/DRIVER2

Virtual Library of Science

Virtual Laboratory of Science

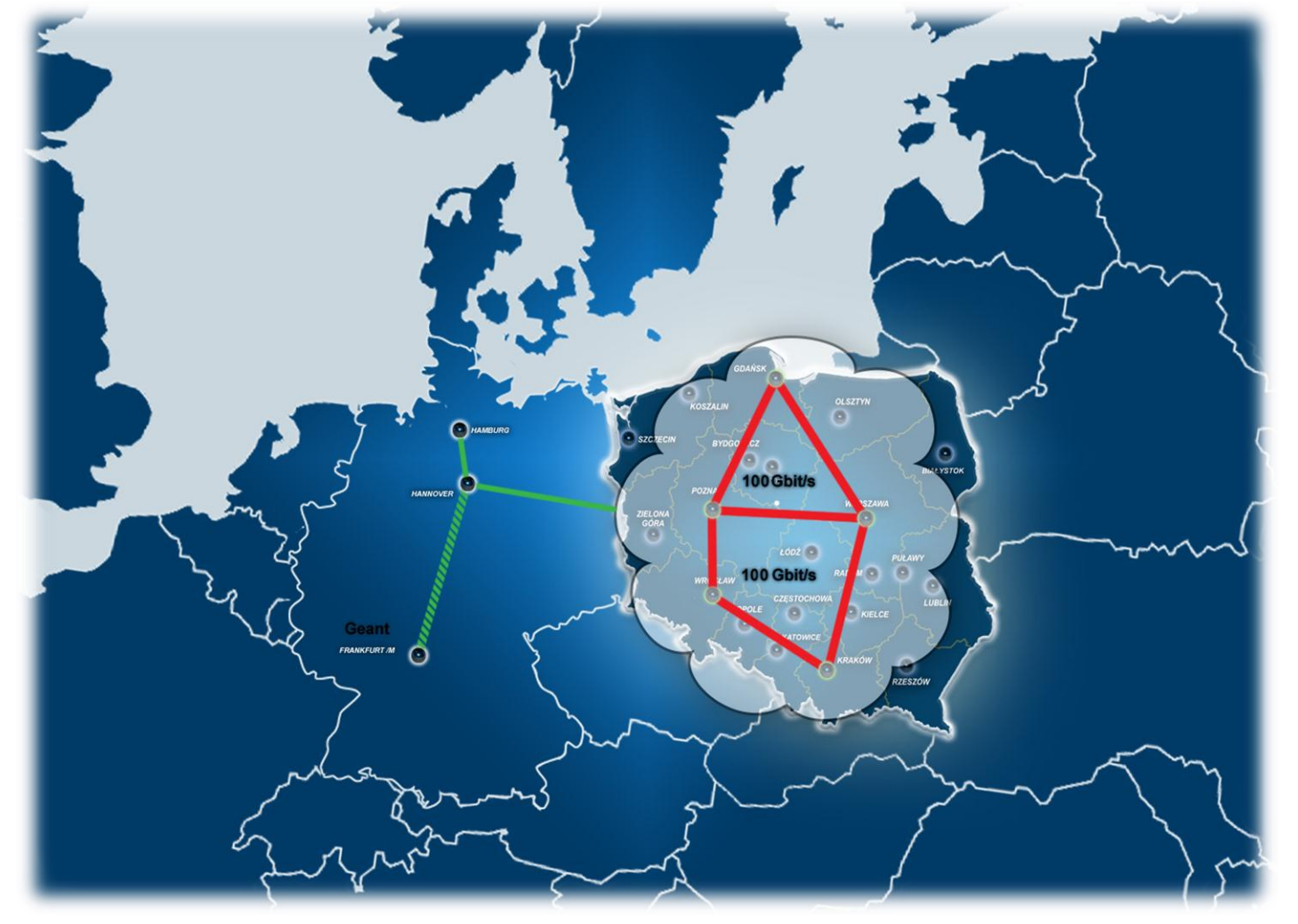
Digital Library Federation

Research challenges (1)

Deployment of 100 Gbps lambdas in PIONIER

Research challenges (2)

Dedicated 100G lambdas for PRACE initiative



Research challenges (3)

Network for atomic clocks synchronisation and ultra precision scale of time

- The dedicated network infrastructure for ultra precision time facilities
- The new research on technologies of time signal transfer and time control
- Cooperation with end users for service deployment

Thank you

Questions?