GRID

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Networking infrastructure

- Polish computing infrastructure for science is based on the PIONIER optical network for science, which connects 24 university centers with 2 x 10 Gbps lines
- The access to European network is provided via connection to GEANT (2 x 10 Gbps), SURFnet and NORDUnet (4 x 10 Gbps) , DFN (2 x 10 Gbps); in addition dark fibers are layout on the borders to Belorussia, Czech Republic, Slovakia, Lithuania, Russia and Ukraine

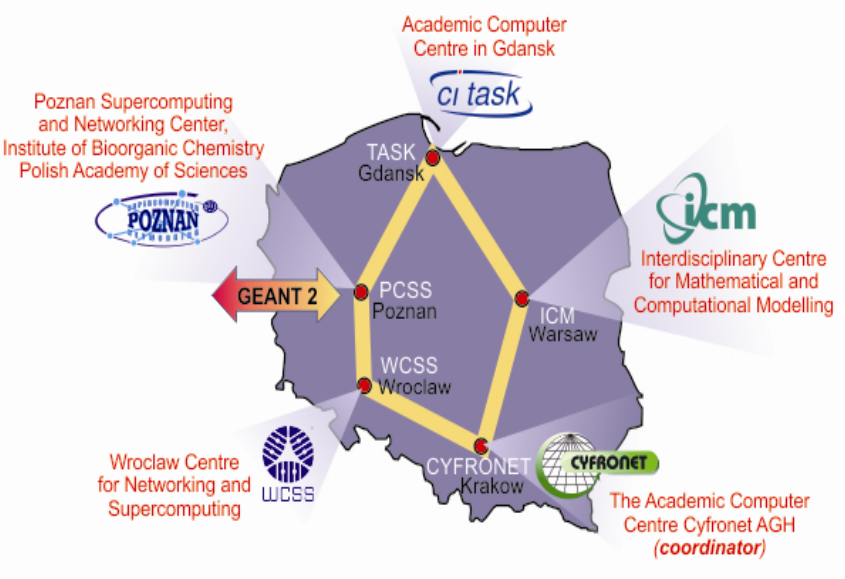
- Built entirely from the KBN (Committee for Scientific Research) funds
- Two independent transmission systems, using separate optical fibers are installed in PIONIER network infrastructure
- The first system offers two 2x10 Gbit/s links which connect all 21 Metropolitan Area Academic Networks
- The second DWDM transmission system enables to use 80 10 Gbit/s optical channels

History of Grid in Poland

- Grid systems are global computational infrastructures developed primarily to integrate and provision distributed computing resources for scientific research
- Polish computing centers participated individually in EU Grid development projects like DataGrid, CrossGrid and EGEE I,II,III right from the beginning (2001)
- Later it was realized that a better organization of management and access to grid resources can be achieved on a national level. In January 2007 a consortium PL-Grid was created in Poland.
- Same idea was at foundation of the European Grid Initiative (EGI) project started in 2008 which aimed to build global computing infrastructure from resources managed by National Grid Initiative organizations (NGI). PL-Grid became one of the first NGIs.
- In the last years the Polish computing infrastructure developed largely due to EU structural funds allocated to several projects:
  - PL-GRID: IT platform based on Grid computer clusters
  - PL-GRID PLUS: infrastructure and services for supporting computational sciences of European Research Area (ERA)

PL-Grid

- Polish NGI (National Grid Infrastructure) Consortium (PL-Grid) with partners ACC Cyfronet AGH in Kraków, PSNC in Poznań, ICM in Warsaw, CI TASK in Gdańsk and WCNS from Wrocław
- Foundation of the consortium was the agreement to integrate national distributed computing resources in order to provide the Polish research community with on-demand access to a sustainable computing platform with transparent access to international grid resources
- PL-GRID Project funded March 2009 by the European Regional Development Fund as part of the Innovative Economy Program
  - ➢Goal: prepare aggregated offer for the community consisting of 215 TFlops of computational power and 2.5 PB of storage resources
  - ❑Duration: 1.1.2009 – 31.3.2012
  - ❑Budget: total 21 M€

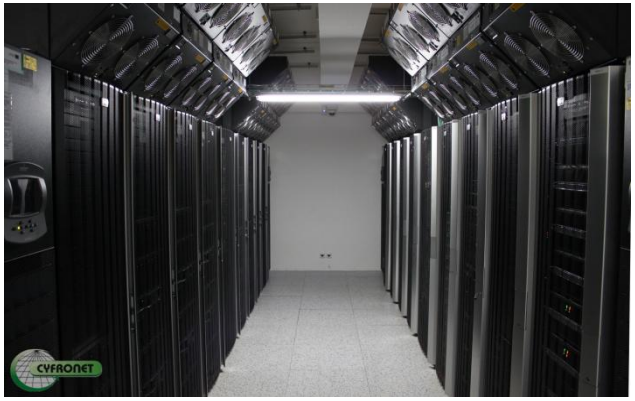


PL-Grid Plus

- PL-Grid Plus is a follow-up project that allows the consortium to continue its activities in the area of grids and clouds for scientific community
- PL-Grid Plus project goals
  - Design and deployment of “domain grids” – solutions for scientific-domain related services, tools and software packages
  - Expansion of the existing infrastructure resources and supporting infrastructure
  - Deployment of Quality of Service system by introducing SLA agreement
  - Cloud Computing for Polish Science
- PL-GRID PLUS Project funded by the European Regional Development Fund as a part of the Innovative Economy Program
  - Duration: 1.10.2011 – 30.9.2014
  - Budget: total ca. 18 M€

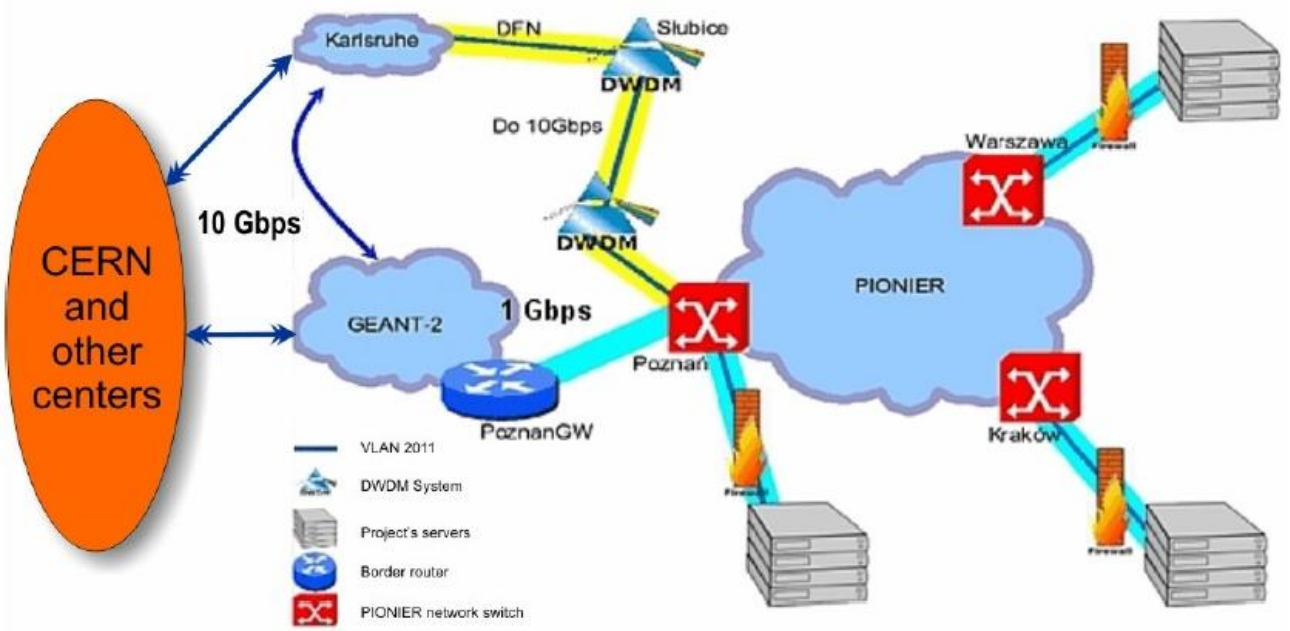
PL-Grid in TOP500

Rank	Site	System	Cores	Rmax TFlop/s
88	Cyfronet Kraków	**Zeus** - Cluster Platform 3000 BL 2x220, Xeon X5650 6C 2.66 GHz, Infiniband, HP	15264	128.8
279	TASK Gdańsk	**Galera Plus** - ACTION Xeon HP BL2x220/BL490 E5345/L5640 Infiniband, ACTION	10384	65.6
296	ICM Warsaw	**Boreas** - Power 775, POWER7 8C 3.84 GHz, Custom, IBM	2560	64.3
298	PCSS Poznań	Rackable C1103-G15, Opteron 6234 12C 2.40 GHz, Infiniband QDR, SGI	5640	63.9
360	WCSS Wrocław	**Supernova** - Cluster Platform 3000 BL2x220, X56xx 2.66 Ghz, Infiniband, HP	6348	57.4



Polish Tier2 in WLCG Grid

- Created in 2005 as a „distributed Tier2” with partner computing centers ACC Cyfronet from Kraków, PSNC from Poznań and ICM from Warsaw
  - Fast connection to the Tier-1 at FZK Karlsruhe via dedicated links
  - Fulfill LCG standards of high availability and reliability
  - Deliver an agreed amount of resources for the needs of LHC experiments



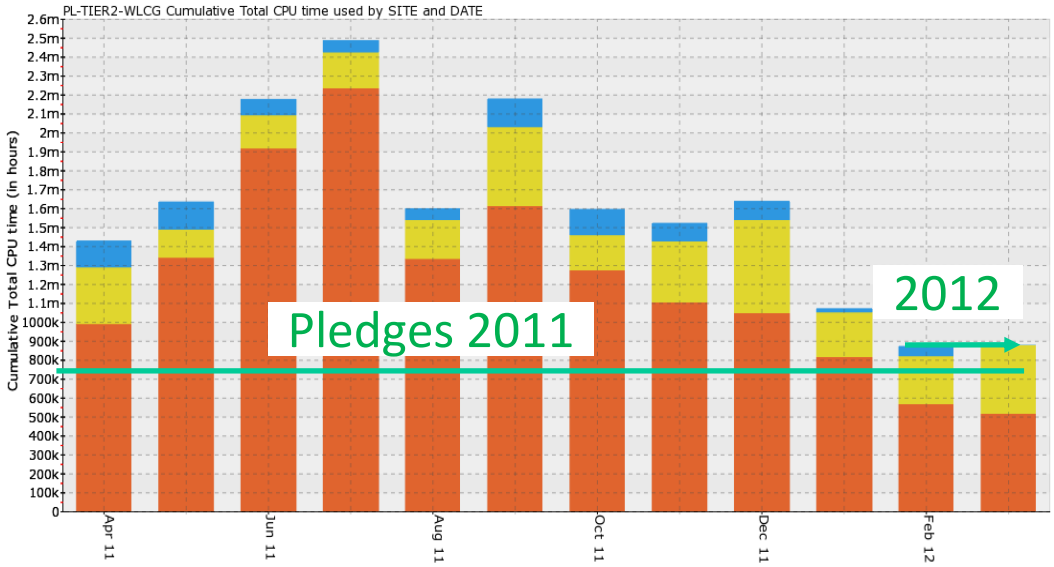
- In 2007 Poland signed the Memorandum of Understanding for Collaboration in the Deployment and Exploitation of the Worldwide LHC Computing Grid

Polish pledges in WLCG Grid

Current pledges of computing resources for Polish Tier-2

Polish Tier2	2010	2011	2012	
CPU (HS06)	10540	13050	15080	2%
Disk (TB)	599	810	1020	1%

In 2011 Polish Tier2 was delivering processing power in amounts fulfilling pledges

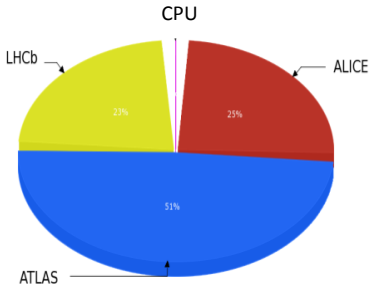


Storage generally below pledges

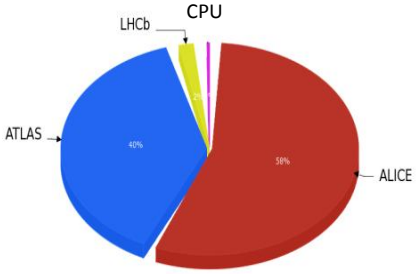
2010: 390 TB vs 599 TB pledged
2011: 560 TB vs 810 TB pledged
(estimates from various sources)
2012: storage is collected, Atlas experiment is promised to get full pledges by end of April

Support for LHC experiments

- ALICE – ACC CYFRONET AGH in Kraków and PSNC in Poznań. Mainly Monte Carlo production. In 2011 Polish sites provided about 4.1% of total ALICE resources.
- ATLAS – ACC CYFRONET AGH in Kraków and PSNC in Poznań. All central production. User analysis only in Kraków. Local user analysis on Tier3 site at INP PAN, Kraków. In 2011 Polish sites delivered 2-3% CPU processing time used by ATLAS.
- CMS – ICM in Warsaw. Monte Carlo production. Local user analysis on Tier3 cluster at UW+IPJ, Warsaw. The ICM site contributed to about 0.6% of all events processed by CMS Tier2 sites.
- LHCb – ACC CYFRONET AGH in Kraków and ICM in Warsaw. Monte Carlo production. Local user analysis on Tier3 site at INP PAN, Kraków. In 2011 Polish contribution amounted to 3.9% of the total LHCb events processed.



KRAKÓW



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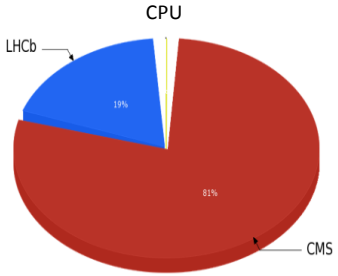

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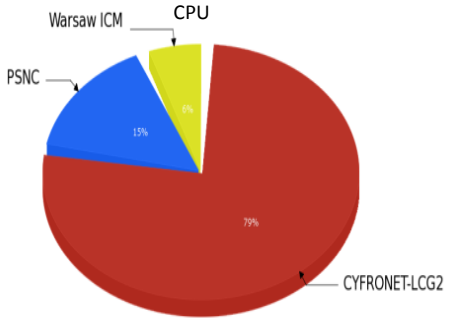

POLISH TIER2

Organization & Financing

- Polish Funding Agency for WLCG is Minister of Science & Higher Education
- Computing resources are provided under the agreement of the Memorandum of Understanding for Collaboration in the Deployment and Exploitation of the Worldwide LHC Computing Grid that Poland signed in 2007
- Most of the resources at sites belonging to WLCG Polish Tier2 have been made available thanks to the funding of PL-Grid(+) (and earlier) Grid projects
- LHC experiments make separate agreements with individual sites mostly on the basis of local physicist community involvement and contacts
- Polish Tier2 has a general representative to WLCG Collaboration. In addition each experiment has also assigned their Polish contact persons. There is no separate funding for organizational activities in Polish Tier2.
- Manpower for direct cluster administration at Polish Tier2 sites (~3 people/site) has been financed in the past mostly from European Grid projects (like EGEE) and now from projects like PL-Grid(+).
- Financing of the WLCG Grid support is based on short term grants.