

# Grid Computing at DESY



\*presented by Patrick Fuhrmann



<http://grid.desy.de/>

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## Introduction

- DESY is one of the world-wide leading centers for research with **particle accelerators** and **synchrotron light**
- DESY operates the electron-hadron storage ring **HERA-II** with three running experiments (H1, HERMES, ZEUS)
- DESY is a **Tier-0/1** centre for the **HERA** experiments
- DESY has traditionally not been involved in CERN experiments and is therefore not part of LHC / **LCG**
- DESY supports the Physics Institutes of the University of Hamburg in their **CMS** Grid activities
- DESY has identified Grid as a **strategic** technology for the future



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# EGEE@DESY

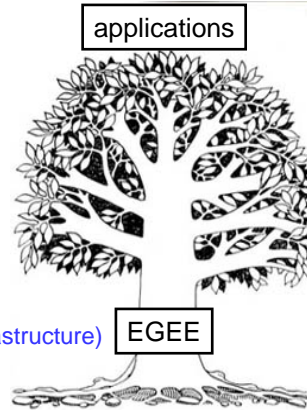


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- Enabling Grids for E-ScienceE
- EU 6th Framework Programme (FP 6)
- Started on April 1<sup>st</sup>, 2004
- 70 partners in 27 countries
- federated in 10 regional Grids
- Headquarter: CERN



- DESY is in D/CH federation
- DESY, DKRZ, FhG-SCAI, FZK, GSI
- DESY is in SA1 (operating a Grid infrastructure)
- DESY is funded with ~ 2FTEyears



- DESY provided resources for the GridKa School
- <http://www.eu-egee.org/>



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# D-GRID@DESY



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- R&D programme for a national e-science infrastructure
- DESY is founding member of the HGF institutes
- Organization in 6 communities
- Anticipated programme start is January 1<sup>st</sup>, 2005, for 3 year
- Funding volume of 20 MEUR
- Project proposal are due on October 22<sup>nd</sup>, 2004
- A handful of community specific projects and 1 integration project
- DESY leads HEP Community Project (CP)
- DESY participates in the Integration project (IP), led by GridKa
- DESY brings in know-how and experiences in data management



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## ILDG@DESY



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- In *Lattice QCD* (LQCD) costly simulations so-called *configurations*, performed on High Performance Clusters are the basis for research activities
- The *International Lattice DataGrid* (ILDG) was started with the aim of making gauge field *configurations* available to an international group of scientists using Grid technologies
- Each *configuration* submitted to ILDG will consist of a set of meta-data and a set of binary files
- In the context of the German *Lattice Forum* (LATFOR) DESY is setting up a Data Grid testbed, exploiting the common Grid infrastructure, in particular the catalogue services



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## LCG@DESY



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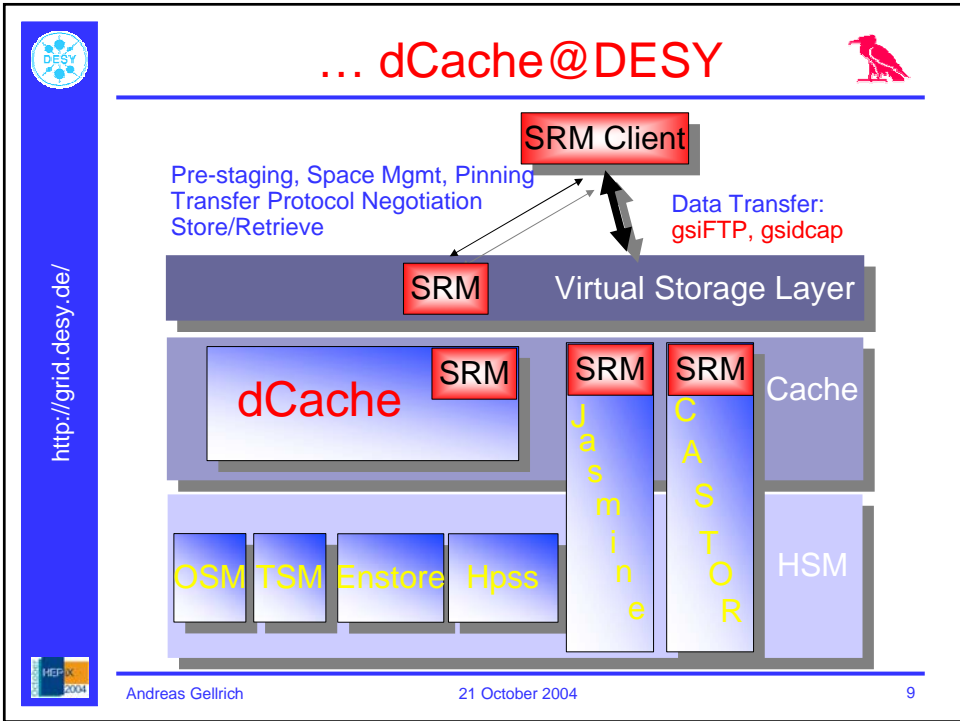
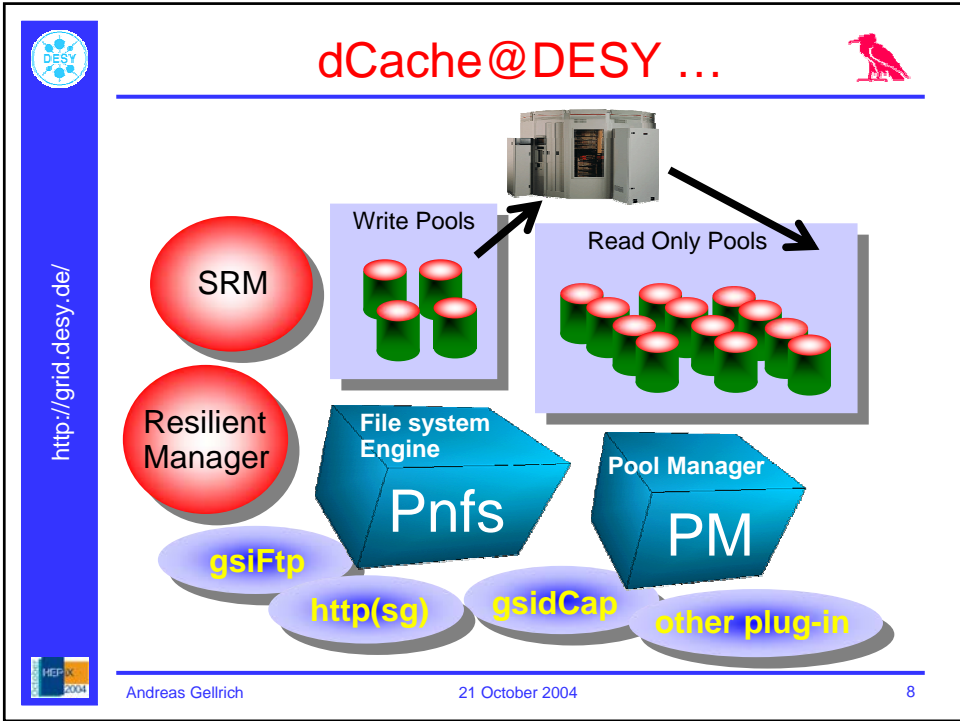
- Some physics institutes of the *University of Hamburg* are located on the DESY site
- DESY supports the institutes by providing computing infrastructure
- The Institute for Experimental Physics is partner of the *CMS* collaboration at LHC
- In a joint effort between DESY and the institute a Grid infrastructure to enable LCG on site will be installed
- Their Grid hardware is incorporated in the common DESY Grid infrastructure
- In cooperation with the University of Aachen a *CMS Tier-2* centre is planned in *Germany*



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# Grid Infrastructure at DESY



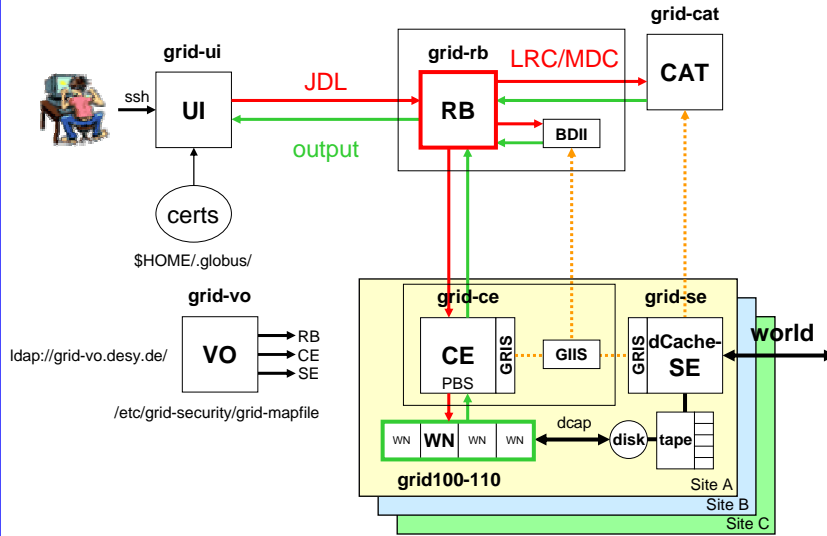
## Grid Infrastructure at DESY

- DESY installed and operates a complete and independent Grid infrastructure which provides **generic Grid services** to all experiments and groups a DESY
- The **DESY Production Grid** is based on LCG\_2\_2\_0 and includes:
  - Resource Broker (RB), Information Index (BDII), Proxy (PXY)
  - Local Replica Catalog (LRC), Meta Data Catalog (MDC)
  - 27 nodes, incl. 17 WNs (34 CPUs)
  - dCache-based SE with access to the entire DESY data space of 0.5 PB
- **Certification services** for DESY users in cooperation with GridKa 
- **VO management** for the HERA experiments ('hone', 'herab', 'hermes', 'zeus'), LQCD ('ildg'), ILC ('ilc'), Astro-particle Physics ('baikal', 'icecube') 



# DESY Production Grid ...

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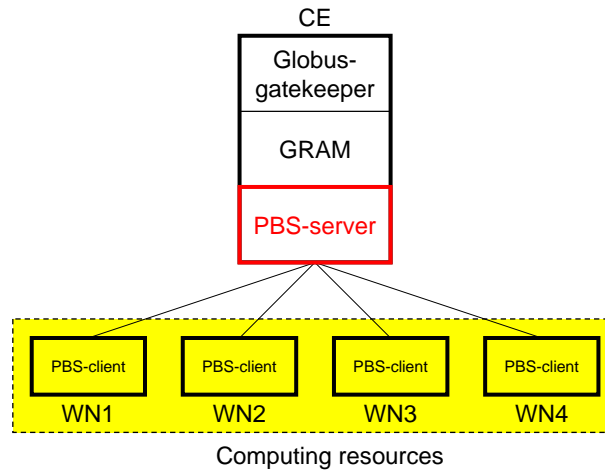
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# DESY Production Grid: Classical Set-up

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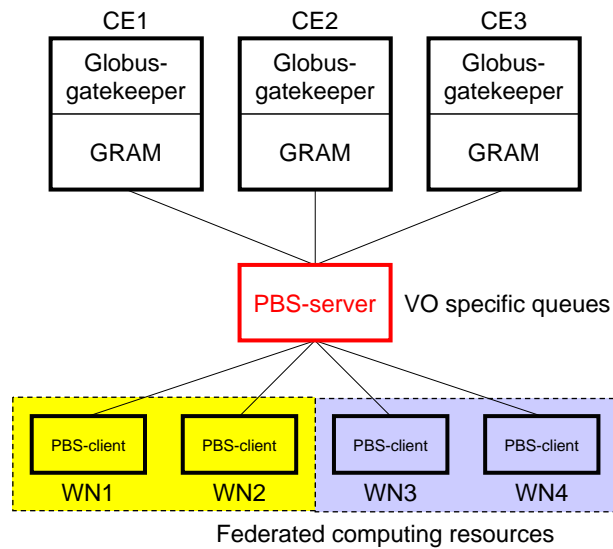
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## DESY Production Grid: Federating Resources

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## ... DESY Production Grid ...

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- rack-mounted 1U servers
- dual Intel P4 XEON 2.8 GHz
- 2 GB DDRAM
- GigaBit Ethernet
- 80 GB (E)IDE system disk
- 200 GB (E)IDE data disk
  
- 10 Gbit/s DESY back-bone
- 1 Gbit/s WAN (G-WIN)



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## ... DESY Production Grid ...



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The LHC Computing Grid, LGG, which was launched in September 2003 with 12 sites contributing, has been growing very rapidly. A snapshot of the 82 sites that were actively contributing to the LGG by August 04 is shown in the map above, which also provides a dynamic view of ongoing activity on the LGG. This map can be accessed at <http://goc.grid-support.ac.uk/lcg2> and was developed by the Grid Operations Centre based at the Rutherford Appleton Laboratory in Oxfordshire.



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## ... DESY Production Grid ...

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- Security aspects:
  - > DESY uses sophisticated **firewall** settings
  - > Services are planned to run in a **DMZ** (partly already achieved for dCache services)
- Installation Experiences:
  - > Manual installation on **SuSE**-based DESY Linux clumsy
  - > **LCFGng**-based easier
  - > Waiting for common HEP Linux (**SL3**) and Quattor (?)
- Operational Experiences:
  - > **AFS** and **NIS/YP** on UIs highly welcomed by users
  - > **dCache**-based SE operational
  - > **LDAP**-based **globus-mds** lacks scalability
  - > **R-GMA** not yet considered



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# Grid Applications at DESY



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## The Challenge

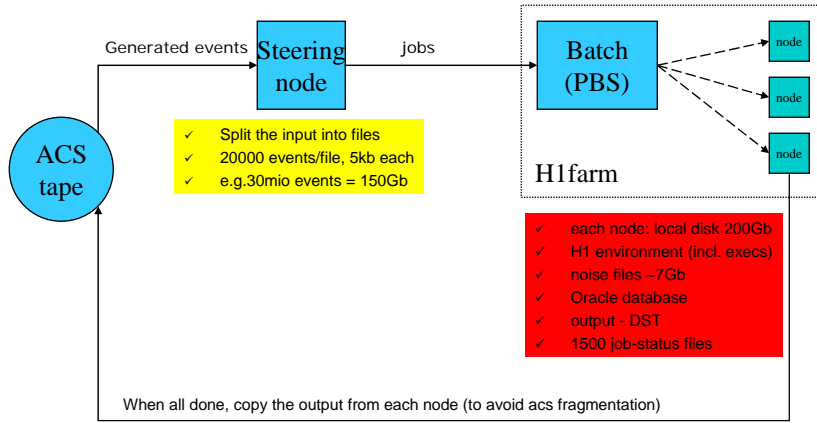
- **HERA-II** drives the demand for MC production
- The paradigms of resource sharing are changing.
- **H1** used to distribute the MC production to dedicated sites which have now started to join the LCG and deploy Grid technologies.
- **ZEUS** has run the MC production system *funnel* for a decade with collaborating sites. Many of them have started to join LCG.
- The *International Linear Collider* (ILC) Detector group aims on data exchange and MC simulation using the Grid. By using the dCache-based SE and the Catalogue Services, the *entire* DESY data space is presented to the Grid.
- H1 and ZEUS distribute their experiment-specific **software** via replica management to SEs than installing locally



# The H1 MC Schema



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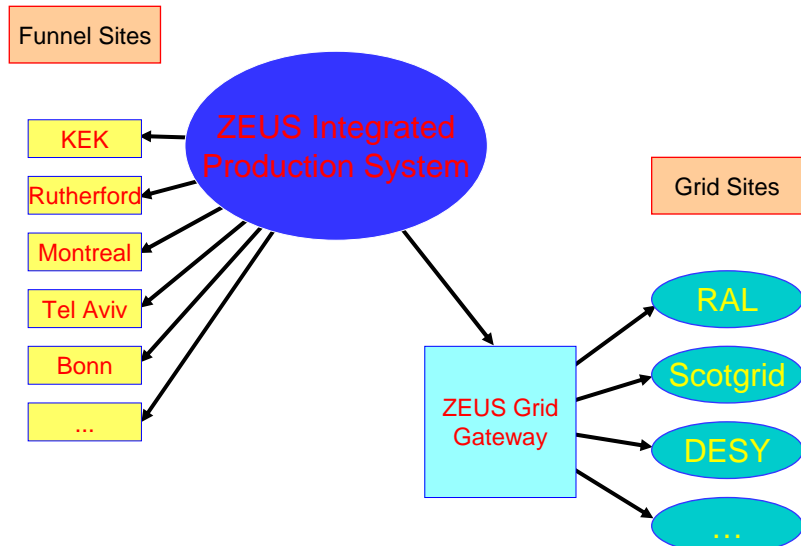
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# ZEUS MC Production ...



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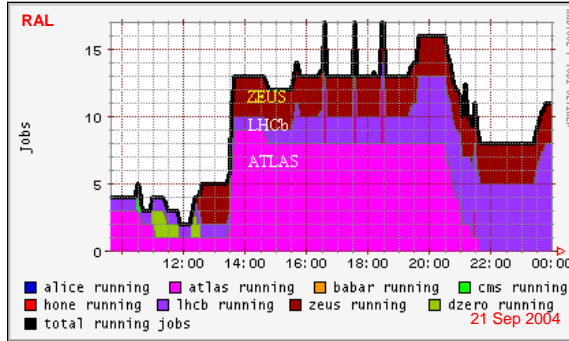
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# ... ZEUS MC Production



- The Grid Sites are currently being integrated in the *ZEUS Integrated MC Production system* (ZIMP) in addition to *funnel*
- ZIMP provides user request portals, book-keeping, statistics, and monitoring and plans for automated production services
- Besides DESY, RAL, ScotGrid (Glasgow), Universities of Hamburg, Dortmund, and Karlsruhe currently support the VO 'zeus'
- 0.5 M events have been produced on the Grid so far
- 84 k events produced at RAL
- Data Quality Management (DQM) has been successfully applied



# Conclusions

- We hope you are convinced *why* and *how* DESY deploys a Grid Infrastructure
- The HERA-II programme drives the demand for MC production
- Changing paradigms of *resource sharing* requires Grid technologies
- Recently started projects expect the Grid to be available on site
- The *DESY Production Grid* provides a common Grid infrastructure, including all generic Grid services
- The HERA *experiments* as well as some globally active *groups* have started to exploit the Grid to share resources with outside partners
- For DESY, the Grid has become a *strategic* technology