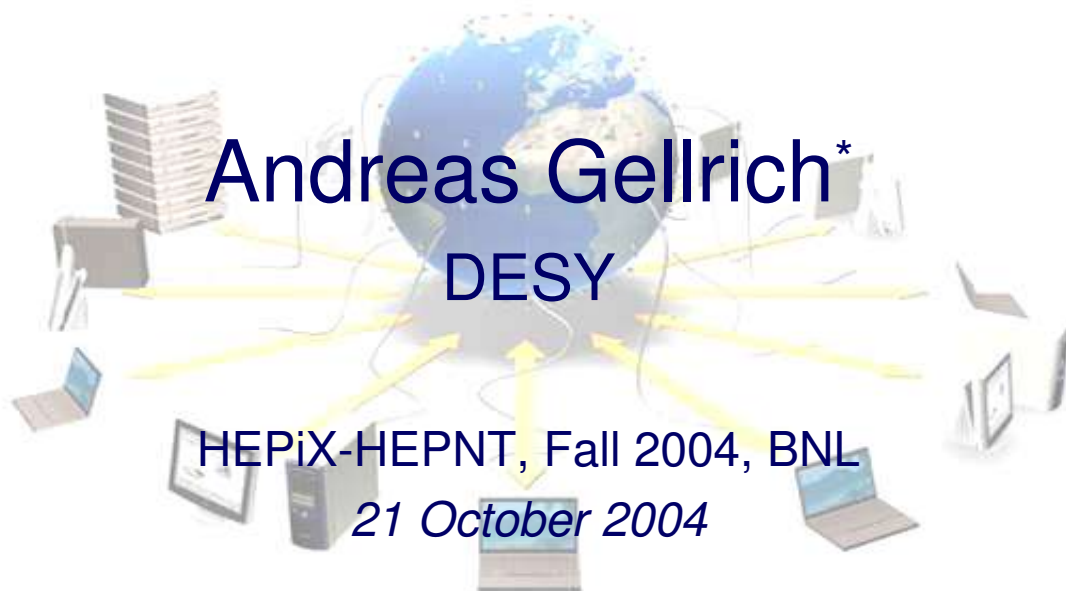


Grid Computing at DESY



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DESY

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*presented by Patrick Fuhrmann



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- Grid Infrastructure at DESY
- Grid Applications at DESY
- Conclusions

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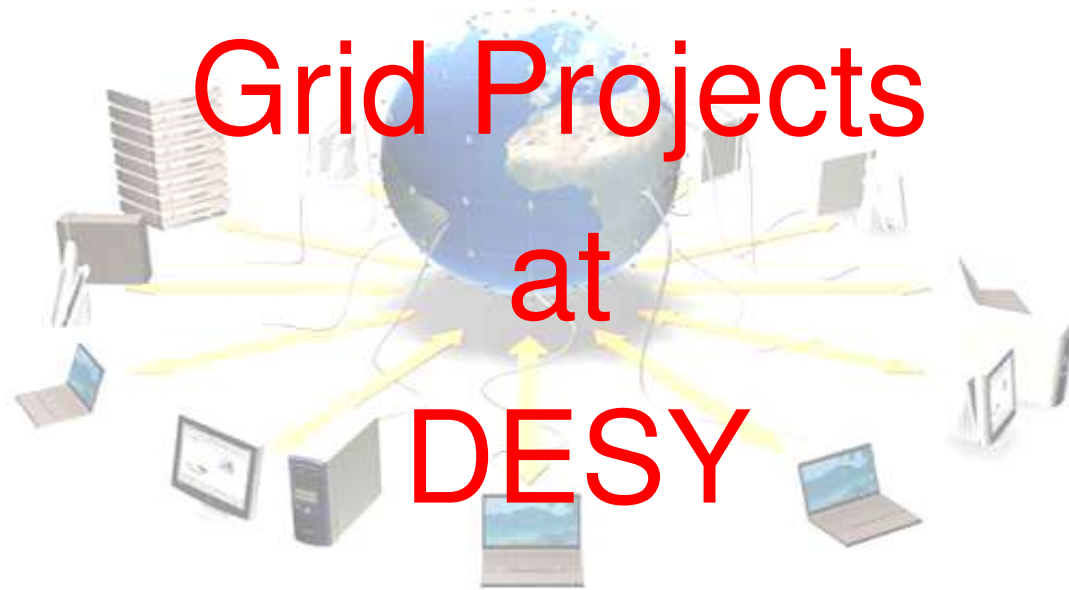
Introduction

- 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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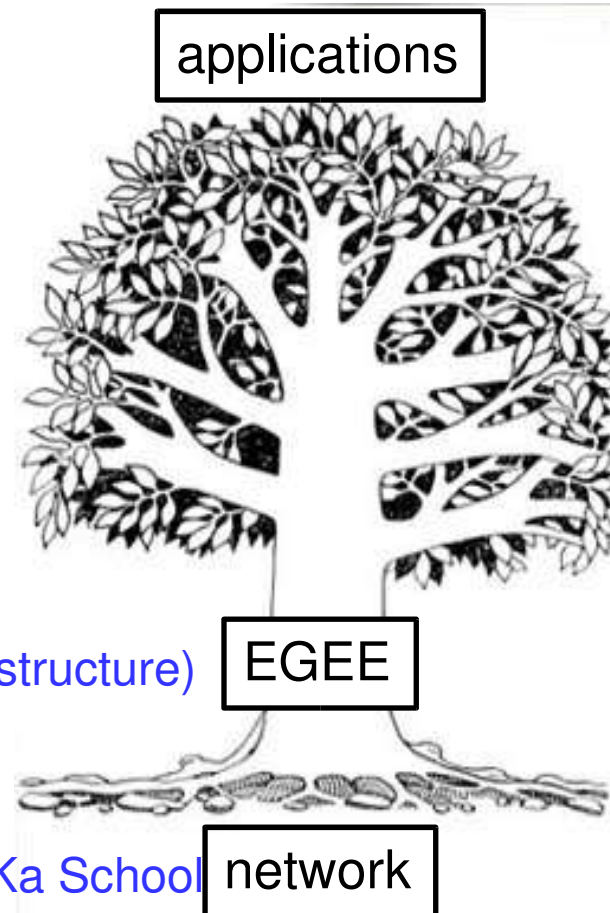




EGEE@DESY

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- Enabling Grids for E-ScienceE
- EU 6th Framework Programme (FP 6)
- Started on April 1st, 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/>





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 1st, 2005, for 3 year
- Funding volume of 20 MEUR
- Project proposal are due on October 22nd, 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



- 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



LCG@DESY



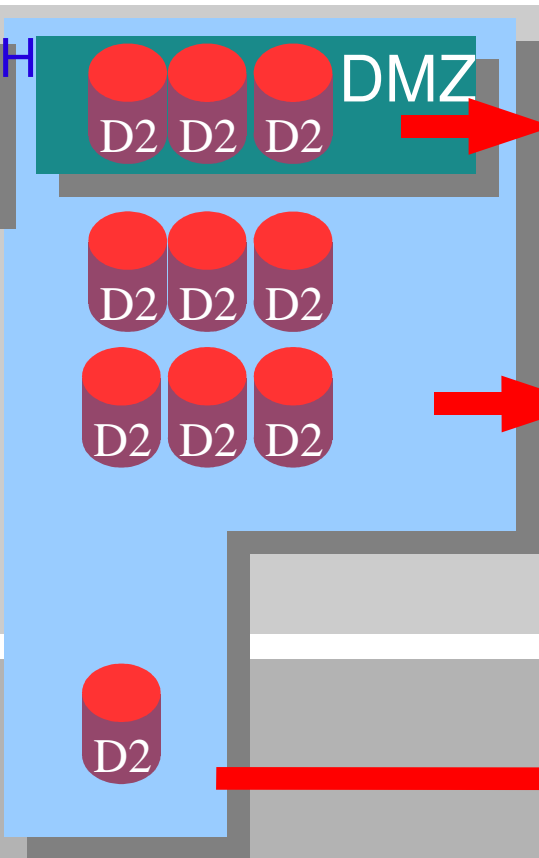
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- Some physics institutes of the **University of Hamburg** are located on the DESY site
- DESY supports the institutes by providing computing infrastructure
- The Institute for Experimental Physics is partner of the **CMS** collaboration at LHC
- In 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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C Central Cache HH
D2 Pre Cache HH
Z Cache Zeuthen





dCache Deployment

- Working together with Ian Birds deployment gang
- dCache developers will be at CERN next week to get into residual technical issues.
- CERN member will be at DESY mid of Nov. to create/improve installation and operating manuals.
- Improving installation for very small installations.
- D-Grid initiative : proposal : 'Scalable Storage Element'
- we **need your feedback** about installation and operating issues
support@dcache.ORG
- most recent 'rpm' on www.dCache.ORG should already be easy to install.



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Grid Infrastructure at DESY

A central graphic illustrating a grid infrastructure. It features a globe in the center, surrounded by various computer hardware including laptops, desktop monitors, and server racks. Numerous yellow arrows radiate from the globe to these devices, symbolizing data flow and network connectivity across a distributed system.



Grid Infrastructure at DESY

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

- DESY installed and operates a complete and independent Grid infrastructure which provides **generic Grid services** to all experiments and groups at 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**



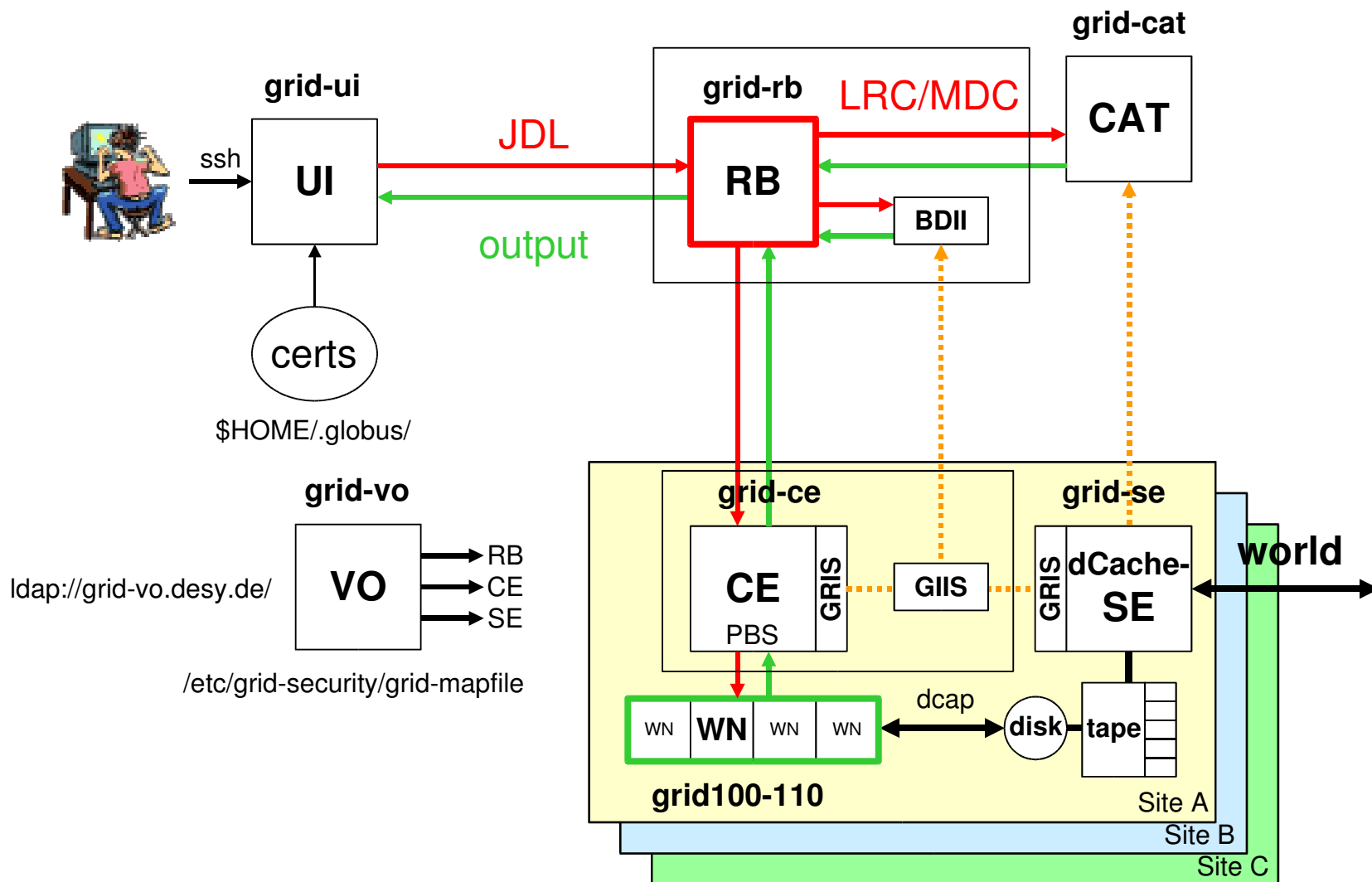
- **Certification** services for DESY users in cooperation with **GridKa**
- **VO** management for the HERA experiments ('*hone*', '*herab*', '*hermes*', '*zeus*'), LQCD ('*ildg*'), ILC ('*ilc*'), Astro-particle Physics ('*baikal*', '*icecube*')





DESY Production Grid ...

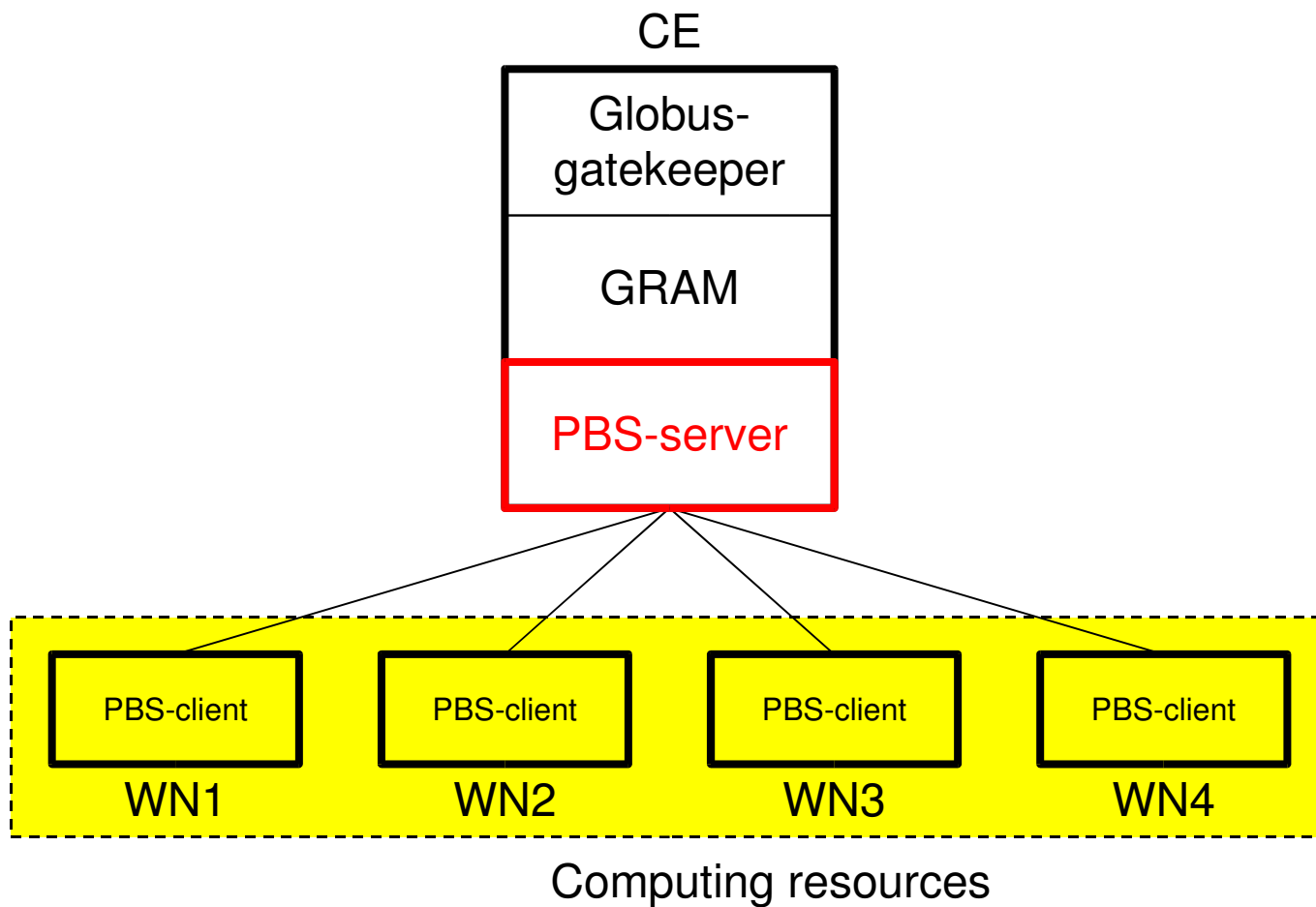
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DESY Production Grid: Classical Set-up

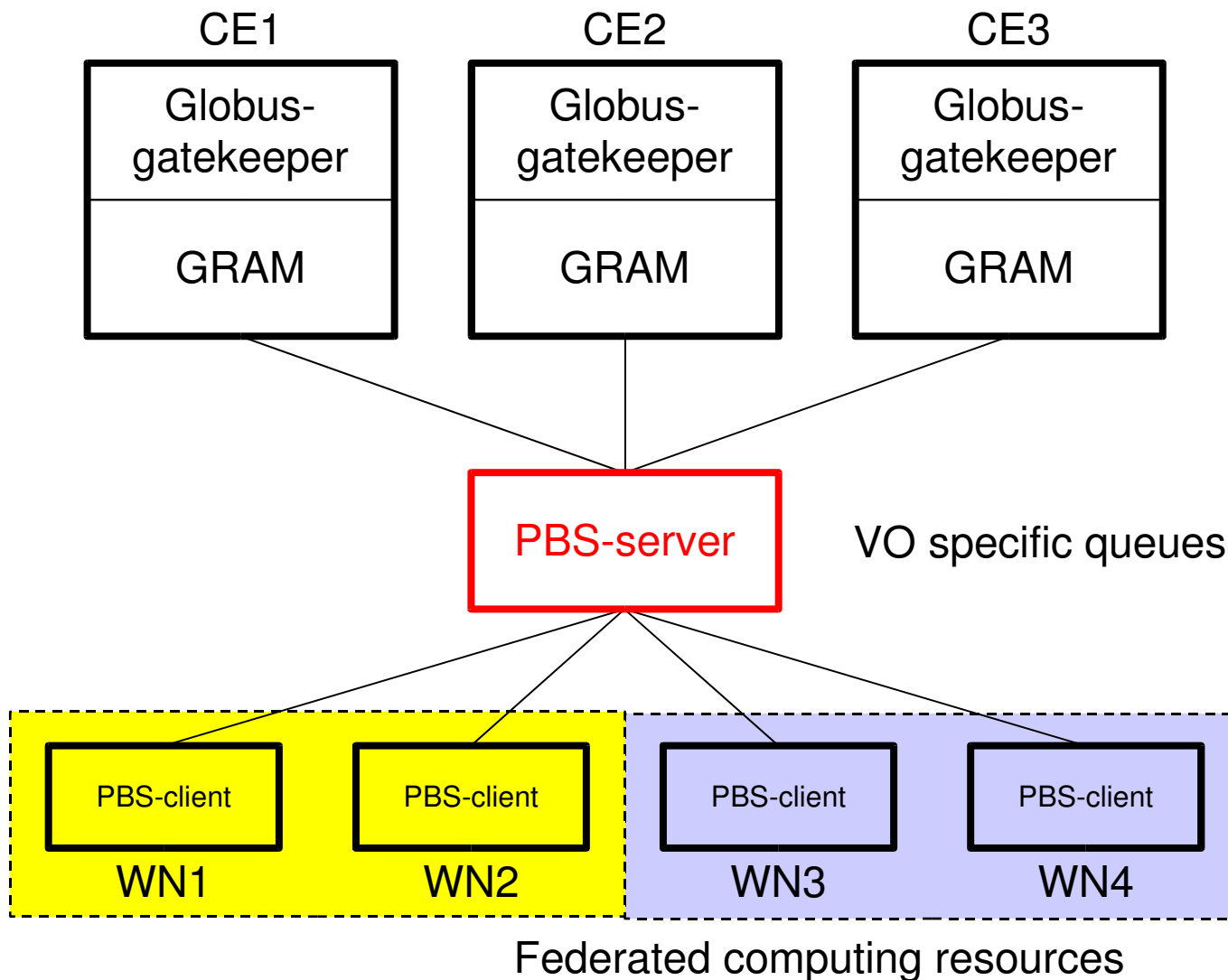
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DESY Production Grid: Federating Resources

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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)





... DESY Production Grid ...



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The LHC Computing Grid, LCG, 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 LCG by August 04 is shown in the map above, which also provides a dynamic view of ongoing activity on the LCG. 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.



... *DESY Production Grid* ...

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

- 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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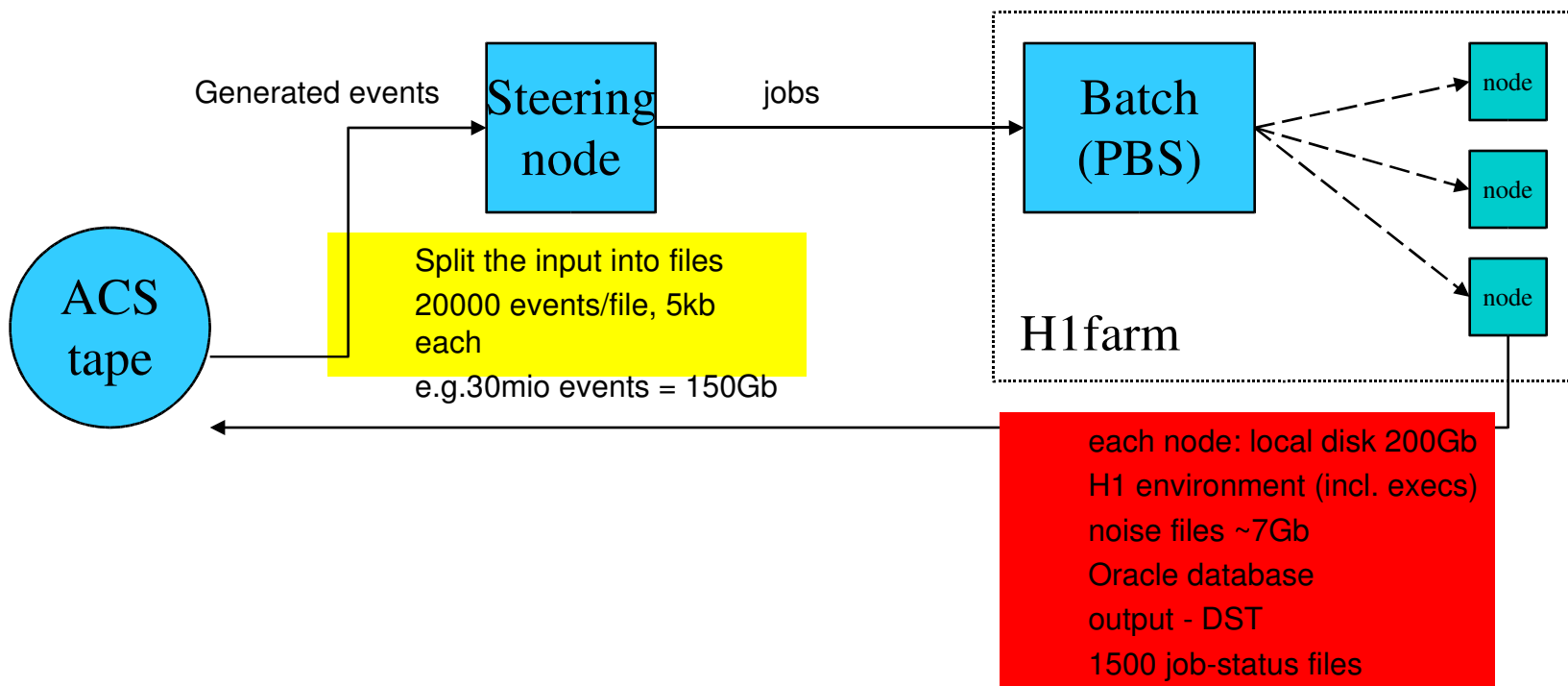




The Challenge

- **HERA-II** drives the demand for MC production
- The paradigms of resource sharing are changing.
- **H1** used to distributes 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 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

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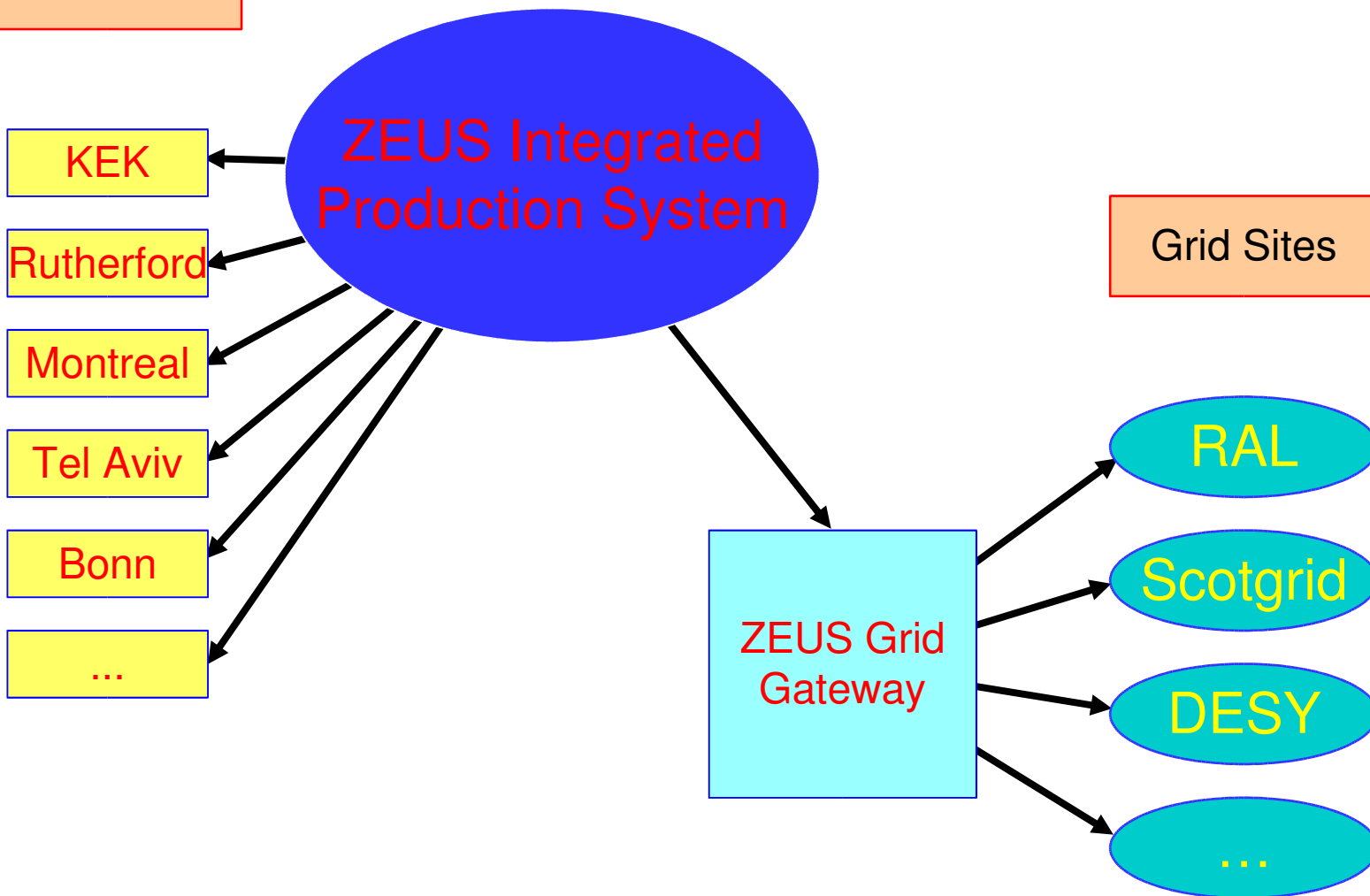
When all done, copy the output from each node (to avoid acs fragmentation)



ZEUS MC Production ...



Funnel Sites



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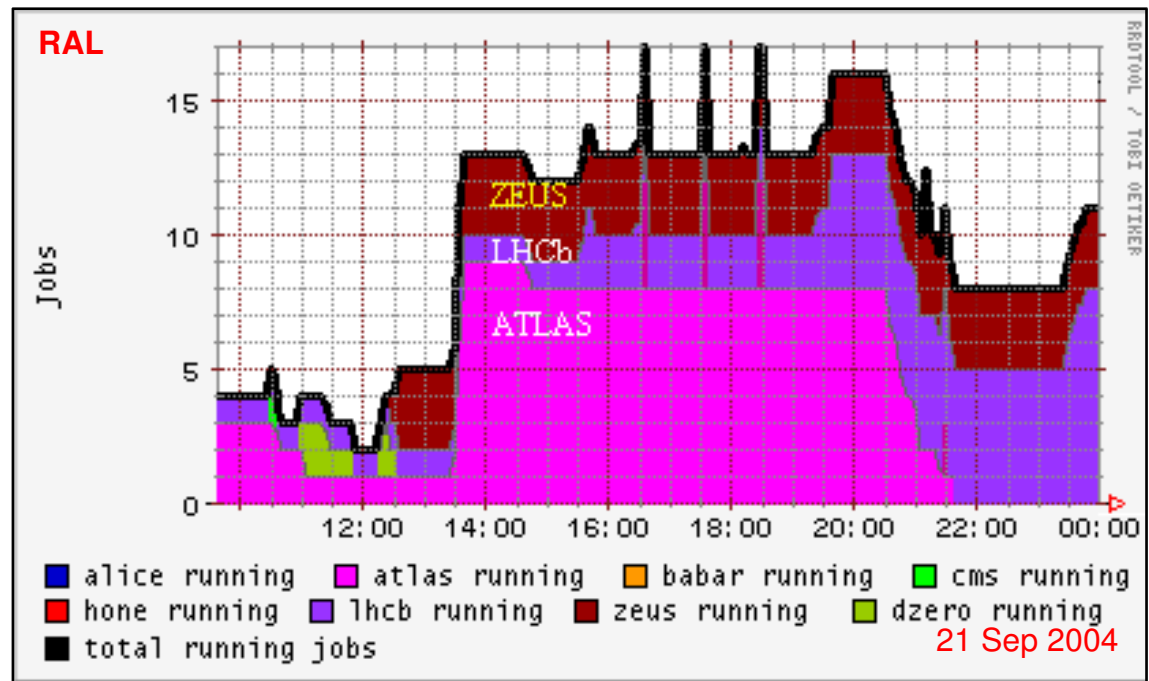


... ZEUS MC Production



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- 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

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