

Building a Production-Grade Grid Infrastructure at DESY*



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DESY



DESY is one of the world-wide leading **centers** for research with **particle accelerators** and **synchrotron light**. The hadron-electron collider **HERA** with its 3 experiments has just recently stopped data taking after more than a decade of running. Data analysis will proceed.

DESY participates actively in the future linear collider project **ILC** by developing the accelerator as well as studying possible detector designs.

DESY has recently decided to take part in the LHC experiments **ATLAS** and **CMS**.

DESY is member of the German/Switzerland (DECH) federation of **EGEE** stated in 2005 and operates its Grid infrastructure in the context of the service area **SA1**. The work is currently in its 2nd phase EGEE-II and is planned to be continuee in EGEE-III from April 2008 on.

DESY is founding partner of the German Grid initiative **D-GRID** and plays a leading role in the HEP community project (HEPCG) and in the integration project (DGI).



Grid Activities at DESY



DESY operates a Grid infrastructure based on the EGEE middleware GLITE-3.

DESY acts as a **WLCG Tier-2** centre for ATLAS, CMS, and LHCb in federation with other German sites.

The HERA experiments **H1** and **ZEUS** as well as **ILC** group perform big parts of their *Monte Carlo* production on the Grid on various LCG sites world-wide.

The **CALICE** collaboration uses the Grid for the direct storage of testbeam data.

For the **LQCD** community an International Lattice Data Grid (**ILDG**) is in operation which enables groups around the world to exchange data sets which are costly produced on super computers. For the purpose dedicated catalogue services have been developed.

DESY develops in collaboration with FNAL the system **dCache** for storing and retrieving huge amounts of data, distributed over a large number of server nodes under a single virtual file system tree. dCache is used in Storage Elements as mass storage fabrics.

Set-up

The DESY Grid Infrastructure is based on the most recent **GLITE** middleware, currently GLITE-3_1_0. It contains all node types to make up a **complete** Grid.

Core services are Resource Brokers (**RB**), Information Index (**BDII**), Proxy Server (**PXY**), Catalog Services (**LFC**), Virtual Organizations Management (**VOMS**).

Resources are published by the site Information Service (**GIIS**) and provided by Computing Elements (**CE**) with Worker Nodes (**WN**), and dCache-based Storage Elements (**SE**) as a back-end to the mass storage facilities.

Resources

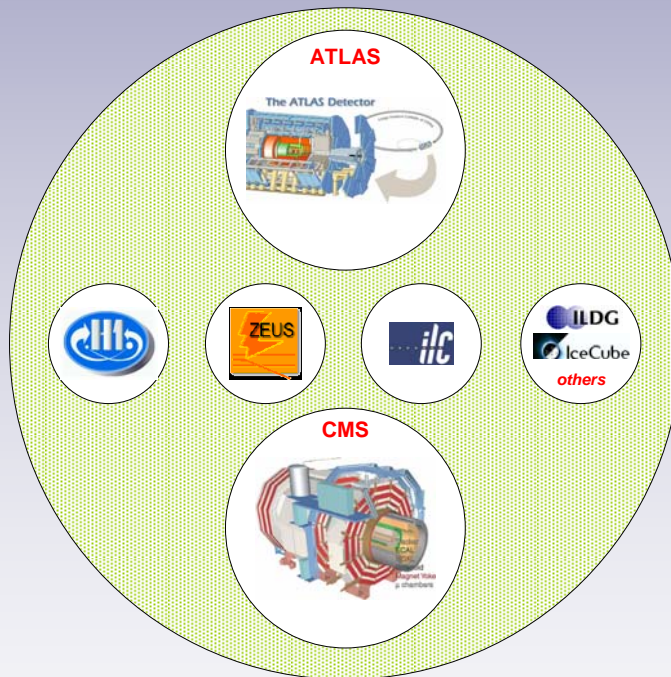
Resources are published by the site-GIIS:
• grid-giis.desy.de:2170

DESY provides computing power:
• 92 Intel **XEON**/3.0 GHz
• 166 AMD **Opteron**/2.4 GHz
• 80 dual-core AMD **Opteron**/2.2 GHz
• 84 dual-core Intel **Woodcrest**/3.0 GHz
• total: 586 core w/ 850 kSI2k

DESY provides storage:
• dCache-SE w/ 200 TB multi pool
• tape back-end 2 PB

DESY has a 1 Gbit/s **WAN** connection (prepared for 10 Gbit/s).

Supporting *all* VOs on one *common* Grid infrastructure.
Virtual *sharing* of the DESY Grid Resources by all VOs.



VO Support

DESY **supports** the LHC VOs '*atlas*', '*cms*', and '*lhcb*'.

DESY **supports** the VOs '*geant4*', '*dteam*', '*ops*'.

DESY **hosts** a number of **global** ('*hone*', '*ilc*', '*zeus*') **regional** ('*baikal*', '*calice*', '*dcms*', '*icecube*', '*ildg*'), and **local** VOs.

DESY provides *all* core services for its VOs.

As a Tier-2 centre for the LHC VOs ATLAS, CMS, and LHCb all requested **VO services**, e.g. VOBOX, PHEDEX, FTS, etc., are operated.

Tier-2 @ DESY

DESY is operating a **Tier-2** centre for **WLCG** in **federation** w/ German universities for **ATLAS** (DESY & U Freiburg), **CMS** (DESY & RWTH Aachen), and **LHCb**.

The Grid resources develops as follows*:

	2007	2008	2009	2010
CPU [kSI2k]	380	1180	1900	3520
Disk [TB]	100	430	780	1270

* incl. DESY Zeuthen

Operational Experiences

The operation of a Grid infrastructure in a **global** context puts new demands to the institution in charge. Due to global dependencies, a new level of quality in providing services must be achieved. The following aspects must be considered:

Installation and **configuration** services for central administration of large farms. This is achieved using **Quattor**.

Monitoring and **alerting** services to operate services reliably (**Ganglia/Nagios**).

Redundancy for mission critical components by using fail-safe hardware and hot and cold stand-by servers.

Operational Aspects

