A multiple VO 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 stopped data taking in 2007 after more than a decade of running. Data analysis is proceeding.

DESY participates actively in the future linear collider project **ILC** by developing the accelerator as well as studying possible detector designs. The LoI for an SLD detector is being prepared.

DESY is member of the Helmholtz Association (**HGF**) and takes part in the LHC experiments **ATLAS** and **CMS**. DESY operates the National Analysis Facility (**NAF**).

DESY is member of the German/Switzerland (**DECH**) federation of **EGEE** started in 2005 and operates its Grid infrastructure in the context of the service area **SA1**. The work is currently in its 3rd phase EGEE-III. A transition to EGI is planned for 2010.

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-3.1**.

DESY acts as a **WLCG Tier-2** centre for ATLAS, CMS, and LHCb in federation with other sites. DESY is part of the **Helmholtz Association** and provides resources for the German VO users.

The HERA experiments **H1** and **ZEUS** as well as **ILC** run their *Monte Carlo* production on the Grid. The CALICE and ILC use 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.

The usage of the Grid for the **synchrotron light** groups **PETRA3**, **FLASH**, and **XFEL** is studied.

Set-up

The DESY Grid Infrastructure is based on the most recent **GLITE** middleware, GLITE-3_1_0 on SL47. It contains all node types to make up a **complete** Grid infrastructure.

Core services are Workload Management Systems (WMS), Information Index (BDII), Proxy Server (PX), Catalog Services (LFC), VO 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 front-end to the hierarchical mass storage system.

All VOs supported on one *common* Grid infrastructure. Virtual *sharing* of the DESY Grid Resources by all VOs.
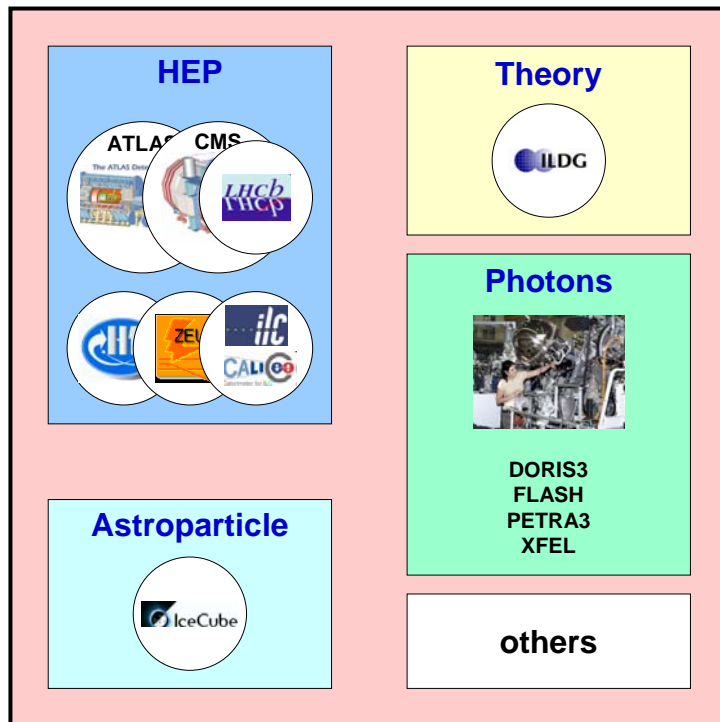
VO Support

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

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

DESY **hosts** the **global** ('*hone*', '*ilc*', '*xfel.eu*', '*zeus*'), **regional** ('*calice*', '*icecube*', '*ildg*', '*xray.vo.eu-egee.org*'), and some **local** VOs.

DESY provides **core services** for the VOs.

As a Tier-2 centre for the LHC VOs ATLAS, CMS, and LHCb w/ **VO-specific services**, e.g. VOBOX, PHEDEX, FTS, etc

Resources

Resources are located on two sites:
- **DESY-HH**: grid-giis.desy.de:2170
- **DESY-ZN**: lcg-giis.ifh.de:2170

DESY provides computing power:
- 2158 core @ 373 hosts
- 450 cores @ 99 hosts
- total: **~5000 kSI2k**

- 2GB RAM per core
- 15GB disk space per core

DESY provides storage:
- dCache-SE w/ **~1000 TB** multi pool
- tape back-end 2 PB

DESY has a **10 Gbit/s WAN** connection.
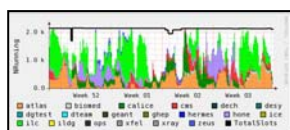
Tier-2 @ DESY

DESY is operating a **Tier-2** centre for **WLCG** in federation w/ German universities for **ATLAS** [1 av. T2] (DESY & U Göttingen), **CMS** [1.5 av. T2] (DESY & RWTH Aachen), and **LHCb**.

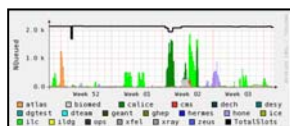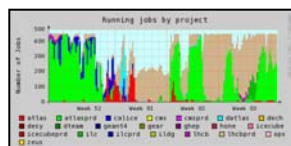The Grid resources develop as follows*:

	2009	2010	2011	2012	2013
CPU [kSI2k]	1733	4230	5794	7352	9343
Disk [TB]	673	1050	1486	1921	2584

* both DESY sites

HEP

ATLAS CMS

Theory

ILDG

Photons

DORIS3
FLASH
PETRA3
XFEL

Astroparticle

IceCube

others

DESY-HH

DESY-ZN

Operational Experiences

The operation of a Grid infrastructure in a **global** context puts new demands to the institution in charge. A new level of quality in providing services must be achieved:

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

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

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

Virtualization techniques are planned.

Grid for Photon Science

Needs are fundamentally different.

No **tradition** in big global collaborations. No VOs in the sense of HEP.

Short term experiments (days) and users (come-and go).

Many/fully independent users.

Little/no sharing of data.

"*Beginning awareness of (scaling) problems in computing.*"

Multi-platform UI or web **portals** required. Easy to use infrastructure required.