Towards a Comprehensive Accounting Solution in the Multi-Middleware Environment of the D-Grid Initiative

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Agenda

- Introduction to the German Grid Initiative D-Grid
- Concept of Sustainability and Consequences for D-Grid
- The Distributed Grid Accounting System (DGAS)
- DGAS and HLRmon in D-Grid
- Future Developments

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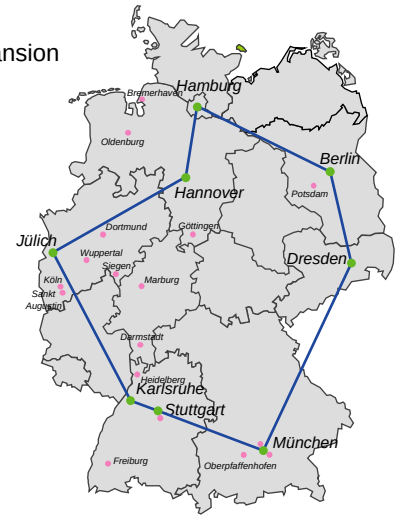
D-Grid Infrastructure

- D-Grid infrastructure, current stage of expansion
  - D-Grid backbone is built from several core locations ●
  - additional resources provided by 17 partners from D-Grid communities ●
  - special funding by the Federal Ministry of Education and Research in Germany
    - ~ 10.000 CPU cores with ≥ 2 GB RAM/core
    - ~ 3,3 PB disk storage
    - ~ 5,5 PB tape storage



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D-Grid Reference Installation I

- Reference installation
  - provided and maintained by the D-Grid Integration Project (DGI)
  - offers the community grids easy-to-install middleware packages
- Core locations
  - have to follow the reference installation
  - have to provide compute services
  - have to provide storage services
- Further information
  - http://www.d-grid.de/index.php?id=297

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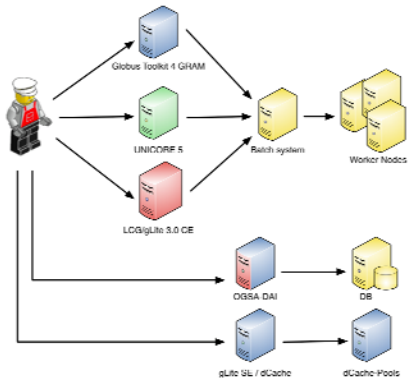
D-Grid Reference Installation II

- Supported Technologies
  - middleware packages
    - Globus Toolkit 4
    - LCG/gLite 3.0
    - UNICORE 5
  - data management
    - gLiteSE/dCache-SRM
    - Globus OGSA-DAI



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D-Grid Concept of Sustainability

- Sustainability has to be reached by
  - self financing e-science infrastructure, independent of public funding
  - development of business models by the communities
  - foundation of the D-Grid GmbH as a public company under German law
    - development of generic services for the communities and resource providers
    - provision of the reference installation and testbed
    - coordination of activities within D-Grid
- Preconditions and consequences
  - meeting the needs of heterogeneous community infrastructures
  - implementation of a unique, all-around accepted accounting system
  - supporting the communities' business models
  - enabling the billing of resource usage

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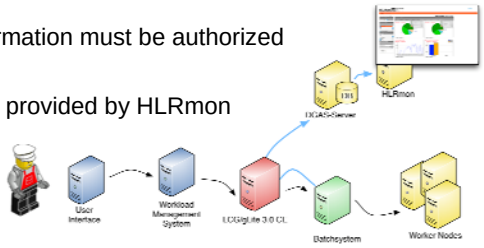
DGAS

- Distributed Grid Accounting System (DGAS)
  - accounting system developed in the EGEE project
  - based on the LCG/gLite middleware package
  - accounting information originates from the batchsystem
    - LSF and PBS/Torque are supported
    - are transformed into usage records
  - accounting information is stored in the Home Location Register (HLR) of the DGAS server
  - access to the accounting information must be authorized
    - command line interface
    - graphical user interface is provided by HLRmon



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HLRmon

- HLRmon - interface for DGAS accounting information
- information from the Home Location Register (HLR)
- hierarchical authorization schema using different roles
  - ROC manager
    - access to all information
  - site manager
    - access to site-related information
  - VO manager
    - access to VO-related information
  - VO user
    - access to information regarding his usage
- condensed information on walltime, CPU-time

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Advantages of DGAS for D-Grid

- Comparison of Grid accounting systems results in DGAS as the choice for D-Grid
  - allows adaptation to enable a uniform accounting of three middlewares
  - hierarchical accounting structure
    - provides high scalability
    - enables internal accounting for VO
  - benchmarks for the normalisation of CPU usage (SPECint and SPECfp)
    - necessary for heterogeneous grids
  - support of the following metrics
    - CPU-time
    - Walltime
    - Memory
    - Vmem
    - requested CPUs
    - used CPUs
  - support of LSF and PBS/Torque
    - support of SGE and LoadLeveler under development

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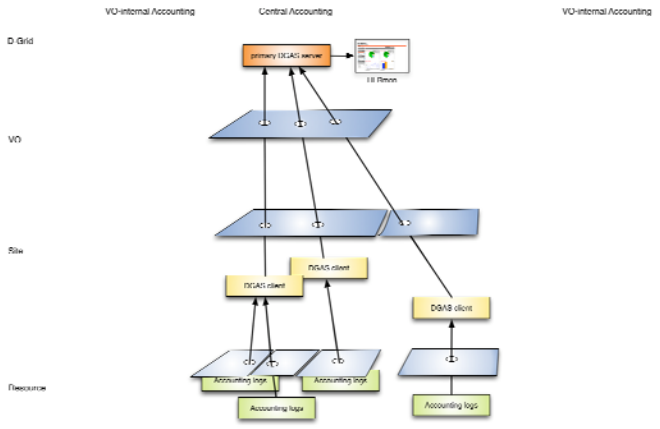
Accounting Structure in D-Grid



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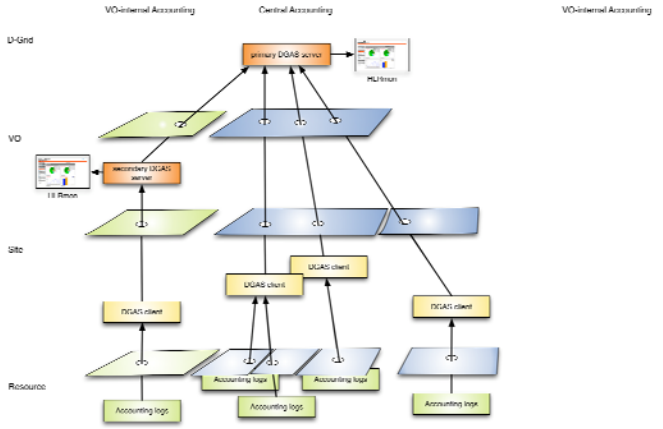

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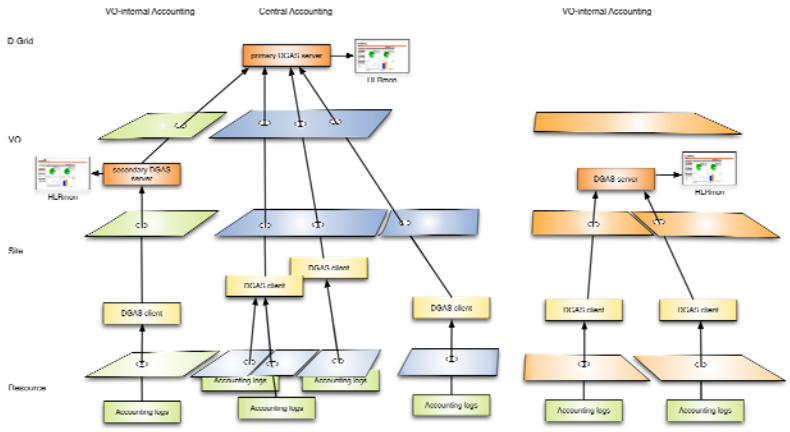

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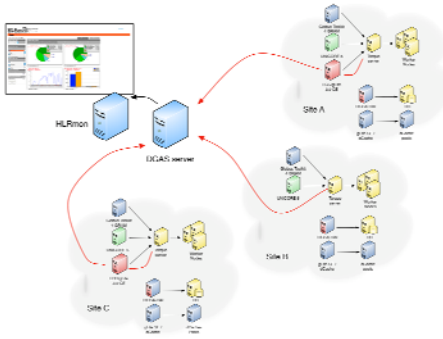
DGAS Implementation in D-Grid

- Central DGAS server
  - located at the RRZN, Hannover
  - currently, 5 sites deliver accounting information
    - Leibniz Universität Hannover
    - TU Dortmund
    - FZ Jülich
    - FZ Karlsruhe
    - OFFIS Oldenburg
- HRLmon as Interface
  - role-based authorization
  - developer version in test



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DGAS Implementation in D-Grid

- DGAS client packages are provided
  - modifications were necessary
    - to account three middlewares
    - to remove dependencies on gLite
  - modified grid-mapfile
- Three constellations are supported
  - LCG/gLite CE and LSF or PBS/Torque
  - another middleware and LSF or PBS/Torque
  - another batch system (e.g. SGE, LoadLeveler ...)

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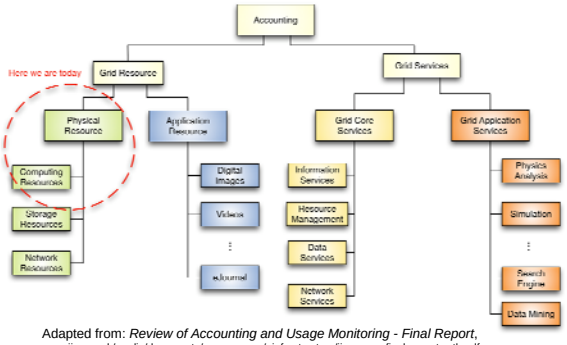
Future Developments

- Development for the D-Grid
  - additional metrics have to be included for comprehensive accounting
  - storage accounting (50% of the total funding for D-Grid hardware in 2006)
  - accounting of licence liable software
  - accounting of cost liable data



Adapted from: *Review of Accounting and Usage Monitoring - Final Report*, www.jisc.ac.uk/media/documents/programmes/einfrastructure/jisc_aum_final_report_wth.pdf

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Thank you!

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