Experiences with using UNICORE in Production Grid Infrastructures DEISA and D-Grid

Distributed European Infrastructure for Supercomputing Applications

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Table of content

DEISA – general aspects

Distributed European Infrastructure for Supercomputing Applications

- Consortium of leading national supercomputing centers in EU
- Deploy and operate an innovative, distributed, terascale Grid-empowered infrastructure
  - to enhance and reinforce High Performance Computing in Europe
  - to be used by scientists and industries in a coherent and comfortable way
  - with production quality being stable, secure, reliable, persistent, ...
    → “no-complains-from-users” services
- Deep integration of middleware and OS / batch system layer

DEISA Partners

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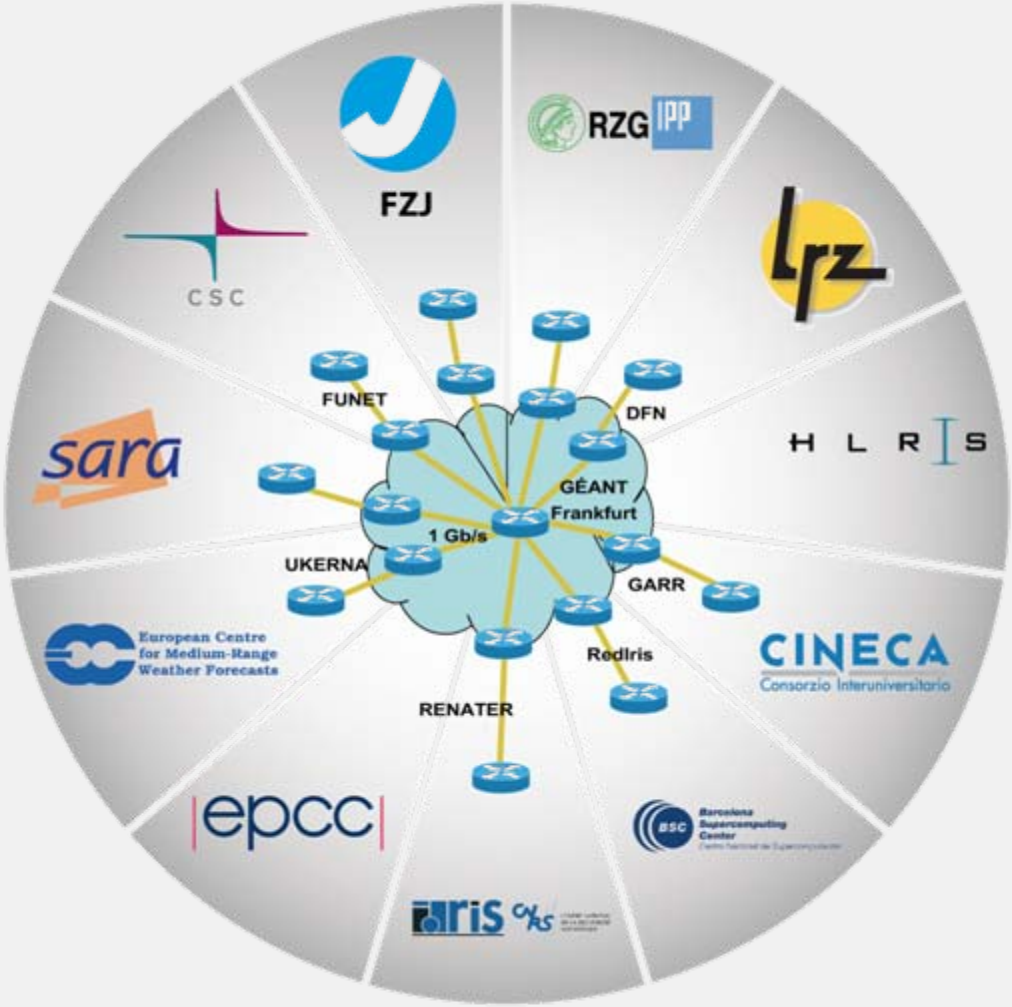

DEISA Service Activities

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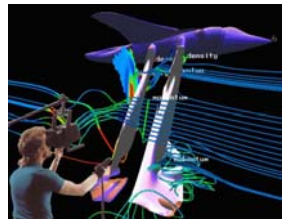
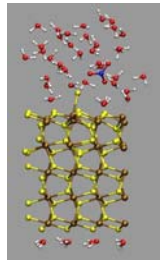
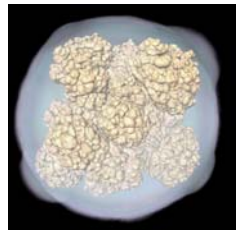
- **SA1 – Network Operation and Support** (FZJ)
  - Deployment and operation of a gigabit per second network infrastructure for an European distributed supercomputing platform. Network operation and optimization during project activity
- **SA2 – Data Management with Global File Systems** (RZG)
  - Deployment and operation of global distributed file systems, as basic building blocks of the “inner” super-cluster, and as a way of implementing global data management in a heterogeneous Grid
- **SA3 – Resource Management** (CINECA)
  - Deployment and operation of global scheduling services for the European super-cluster as well as for its heterogeneous Grid extension
- **SA4 – Applications and User Support** (IDRIS)
  - Enabling the adoption by the scientific community of the distributed supercomputing infrastructure as an efficient instrument for the production of leading computational science
- **SA5 – Security** (SARA)
  - Providing administration, authorization, and authentication for a heterogeneous cluster of HPC systems with special emphasis on single sign-on

- general aspects

- the German Grid initiative
- builds up and operates a sustainable Grid infrastructure
- establishes methods of e-science in the German scientific community
- More than 100 partners
- Started in 2005 with a 100 Million Euro funding from the German ministry for Education and Research
- Initiative contains following projects
  - DGI - D-Grid Integration project
  - AstroGrid-D in astronomy
  - C3-Grid for climate research
  - HEP-Grid for high energy physics
  - InGrid for engineering research
  - MediGrid for medical research
  - TextGrid for humanities



Motivation: Why UNICORE ?

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- Scientists have to use huge computational and storage resources










Motivation: Why UNICORE ?

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- Supercomputers are managed by Resource Management Systems (RMSs) that handle the scheduling
- But: There are many RMSs available
- Many proprietary ways of job submission
  - IBM Loadleveler → **`llsubmit`**…
  - Torque Resource Manager → **`qsub`**…
- Different job description languages (# of nodes, memory requirements…)

Resource Management System

Motivation: Why UNICORE ?

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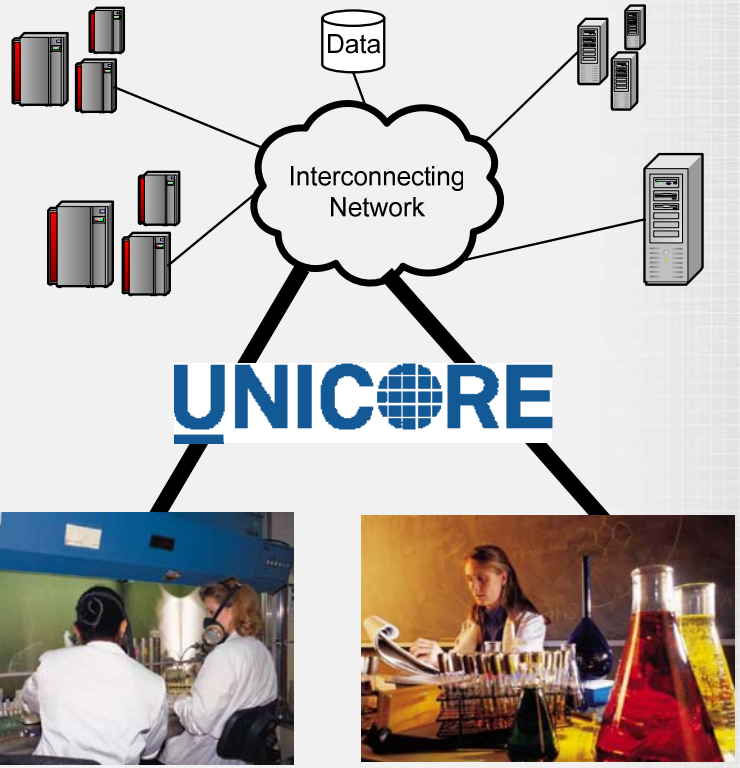
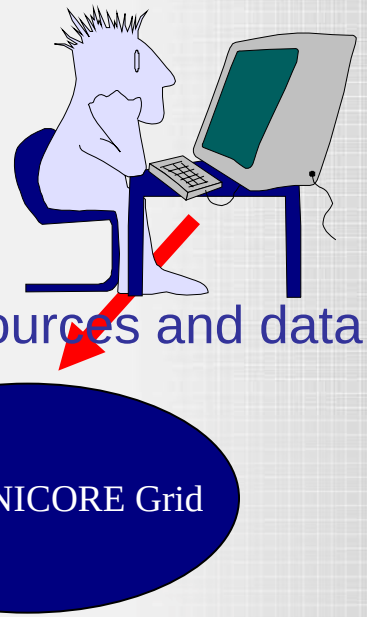
- Solution: Grid System UNICORE
- Define job workflows in abstract manner
- Immediate portability of job definitions for other systems with other architectures
- No ‘learn overhead’ if a new RMS is used

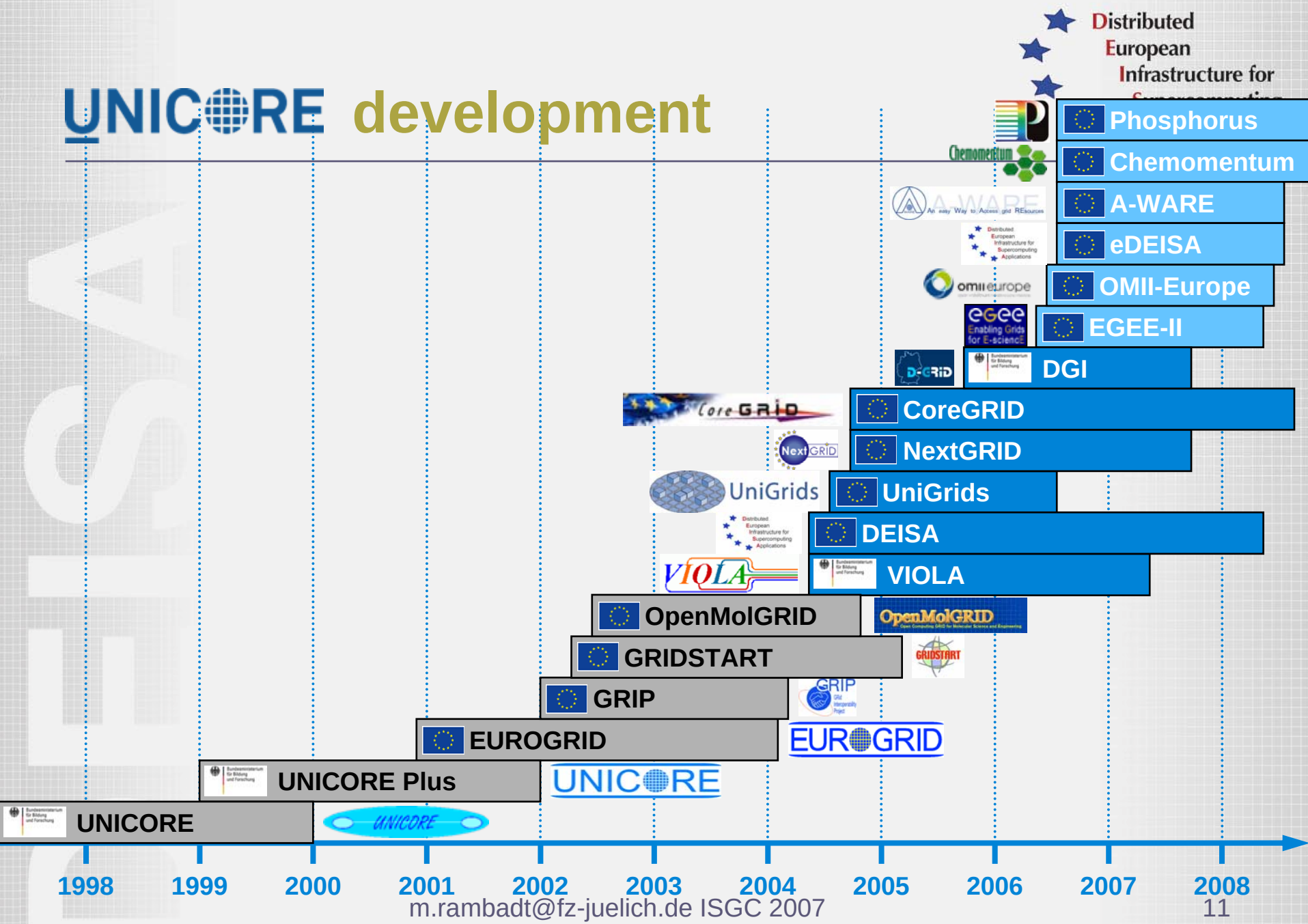


Both DEISA and D-Grid are using UNICORE as Grid middleware



- UNiform Interface to COmputing Resources
- Started as a German funded Project in 1997
- Enhanced in many (European) projects
- Seamless and secure access to distributed resources and data via an intuitive GUI
- workflow engine for
  - complex multi-site multi-step workflows
  - job monitoring
- easy installation and configuration of client and server components

UNICORE development



UNICORE in production

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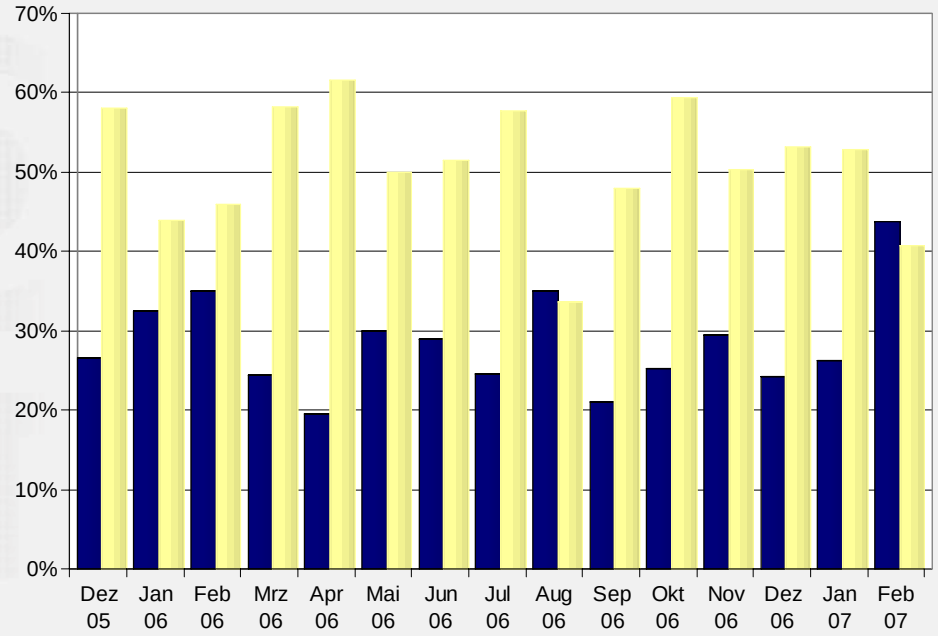
- UNICORE production use on JUMP at Research Centre Juelich (IBM p690 eSeries Cluster (1312 CPUs, 8.9 TFlops)



- Almost 1/3 of all jobs are UNICORE jobs

Lessons Learned…

- Often “only” initial hurdles
  - adapting applications
  - managing certificates
- How easy is it to access the Grid Middleware?
  - Certificate handling
  - Automatic user management in DEISA in D-Grid
- Users have to be stimulated and encouraged to
  - use Grid technology for applications, computations, data transfer and access to resources
  - adapt/integrate their applications to/into Grids
  - once convinced they likely use it further on
- Operation of production environments is costly
  - certification authority, administrative tools, integration into site management, licenses, …

More lessons learned

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- Fulfillment of functional requirements is not enough
- Users want
  - help to overcome initial hurdles
  - 24/7 availability of the Grid infrastructure
    - Monitoring tool SIMON for DEISA and D-Grid UNICORE components
  - 24/7 availability of the Grid experts
    - support hotline, help desk, mailing lists, …
  - long-term commitment for continuous development and support
  - workshops, hands-on training, …
- Agreement on what the users want and what the developers implement is crucial
- Scientist sometimes don't like GUIs
  - DEISA developed DESHL as command line interface to UNICORE to address this

Conclusions

- Production Grids are possible
- But: users only use Grid middleware if
  - Deployment of new production software offers added value
    - Easy usage, increased effectiveness, decreased cost, …
    - integration of legacy applications
- Success of the Grid Middleware depends on successful interaction with other components, working groups, colleagues…
  - Network, File System, underlying batch system, Applications, Security,…
- Functionality is important but also Support, Support, Support…
- Open Source distribution is the right way
  - Source for bug reports, requirements, …
  - Higher visibility & community building

Getting UNICORE

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- Download UNICORE at

UNICORE OPEN SOURCE

- http://www.unicore.eu

Questions?

Thanks...

Thanks...

To all partners who contributed to the UNICORE development in DEISA and D-Grid

Thanks...

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