

# EUROGRID

## European Testbed for GRID Applications

### Demonstration of distributed applications

- Bio-Grid: biomolecular simulations
- Meteo-Grid: weather prediction
- CAE-Grid: coupled computer aided engineering simulations
- HPC-Grid: large scale scientific codes

### Development of Grid software based on UNICORE

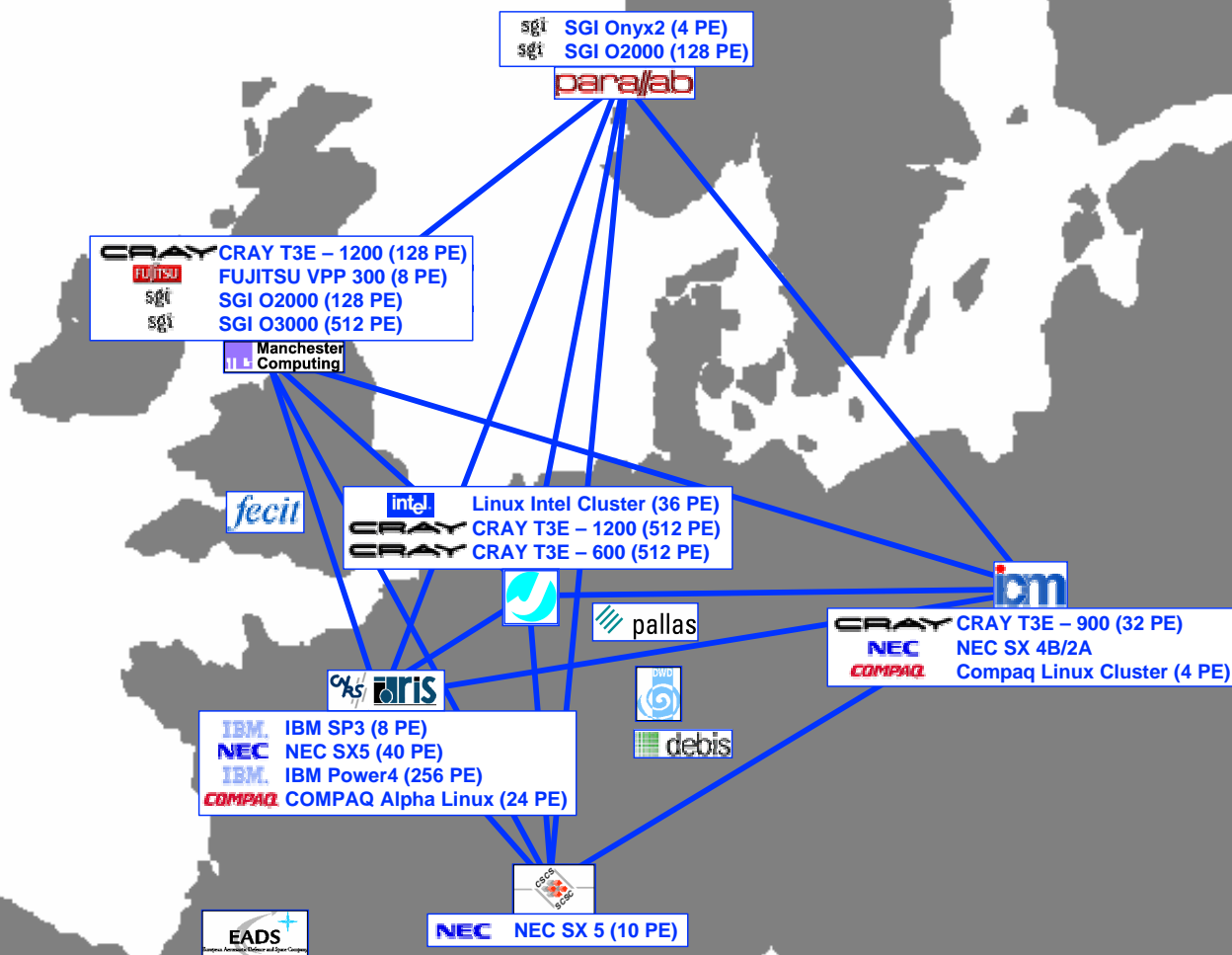
- Interactive application steering
- Efficient data transfer
- Resource broker
- Application service providing

### Contributions to the international Grid development

Duration: November 2000 – October 2003

Funded by EU grant no. IST-1999-20247

URL: <http://www.eurogrid.org>



### HPC Centers

- Forschungszentrum Jülich (D)
- Paralab – University of Bergen (N)
- CNRS – IDRIS (F)
- Warsaw University (PL)
- Victoria University of Manchester (UK)
- ETH Zürich – SCSC Manno (CH)

### Users

- Deutscher Wetterdienst (D)
- GIE EADS CCR (F)
- Assistant Partner:
  - debis Systemhaus (D)

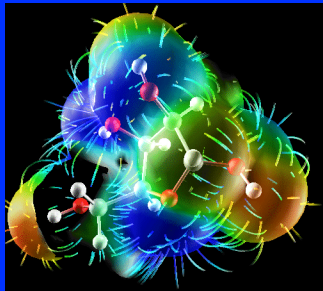
### Integration

- pallas Pallas GmbH (D)
- Assistant Partner:
  - Fujitsu European Centre for Information Technology (UK)

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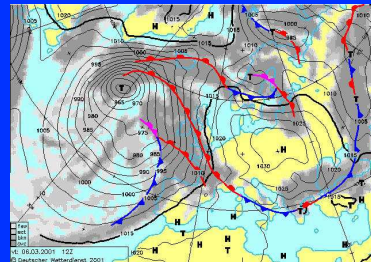
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## Bio GRID



- Operate a GRID for biomolecular simulations
- Develop interfaces to existing biological and chemical codes

## Meteo GRID



- Develop a relocatable version of DWD's weather prediction model
- Goal: 'Weather prediction-on-demand' as an ASP solution

## Technology Development

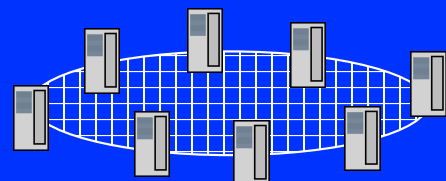
- Build on the functionality of UNICORE
- Extend UNICORE to provide the middleware necessary for the Domain specific GRIDs
  - Efficient data transfer
  - Resource brokering
  - ASP services
  - Application coupling
  - Interactive access

## CAE GRID



- Coupled simulations of aircrafts
- HPC portals for EADS engineers and for engineers at Daimler-Chrysler and partners
- Develop GRID technology for computing cost estimates and billing

## HPC Research GRID



- Demonstrate a European HPC GRID testbed
- Develop new GRID applications
- Enable sharing of competence and know-how
- Agree on security standards, certification, access policies, ...

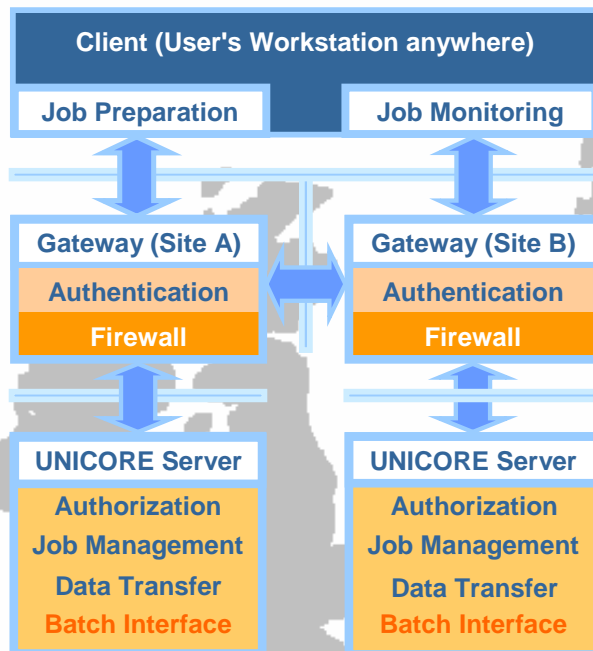
# EUROGRID

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## UNICORE Grid System: Software Base of the EUROGRID Project

### UNICORE Uniform Interface to Computing Resources

- Provides a science and engineering GRID combining distributed resources of supercomputer centers and making them available through the Internet
- Performs strong authentication in a consistent and transparent manner
- Hides differences between platforms from the user
- Creates a seamless HPC portal for accessing supercomputers, compiling and running applications, and transferring data
- URL: <http://www.unicore.de>
- UNICORE Test Grid: <http://www.fz-juelich.de/unicore-test>



### UNICORE System Architecture

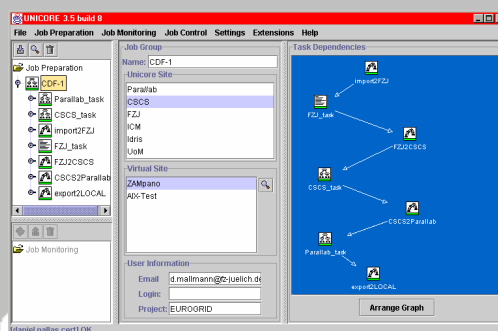
- Clients:** Interacting with the user and providing functions to construct, submit and control the execution of computational jobs
- Gateways:** Acting as point-of-entry into the protected domains of the HPC centers
- Servers:** Schedule and run the jobs on the HPC platforms that they control
- Components written in Java
- Protocols between the components defined using Java mechanisms

### Functions

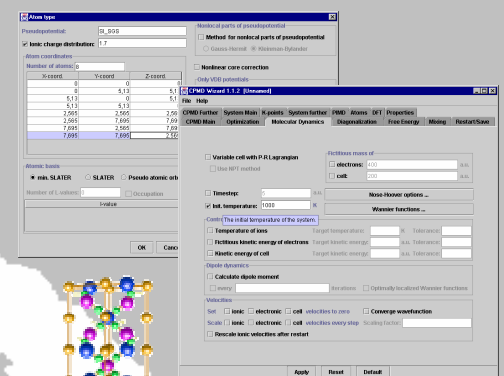
- Interactive creation of batch jobs
- Submission to different platforms at different locations
- Interdependent multi-application and multi-site jobs
- Automatic control of job flow
- Automatic staging of data
- Secure access to remote data
- Reuse of existing jobs
- Authentication of users through x.509 certificates
- Single sign-on to the EUROGRID Testbed
- Mapping to existing user identification at target site
- Authorization of users at target site

### Client

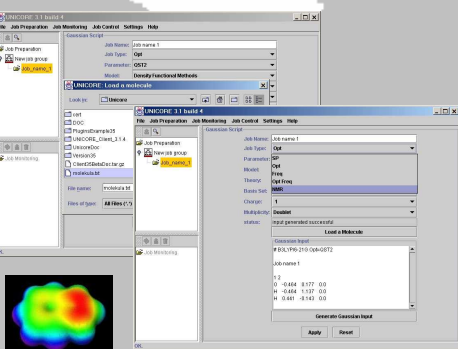
- Prepare and modify structured jobs
- Show resources
- Submit jobs on the Internet
  - execution of scripts
  - data transfer directives
  - application specific interfaces
- Monitor and control of jobs
- Fetch output



Client



CPMD Interface



Gaussian Interface

# EUROGRID

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## Technology Development

- Satisfy requirements generated by domain-specific grids
- Improve EUROGRID take-up and exploitation in both science and industry

## Efficient Data Transfer

- Fail-safe and encrypted transfer
- Overlap of transfer and processing
- Handle latency-critical burst transfers, and bulk transfers which utilise available bandwidth
- Exploit Quality-of-Service aware networks where available

## Resource Brokering

- Dynamic identification of available resources in a GRID
- Broker automatically matches resource requirements of job to available resources
- Selection of possible matches based on various criteria, such as turnaround time, cost, etc.

## ASP Services

- Infrastructure for Application Service Providers (ASPs)
- Provide precise accounting and license billing
- Also provide up-front cost predictions
- Will interface to basic UNIX accounting mechanisms

## Application Coupling

- Integrate communication middleware for weakly coupled applications
- Develop techniques for strongly coupled applications
- Develop interfaces to schedulers for co-scheduling

## Interactive Access

- Interactive control and steering of jobs
- Allow use of interactive applications
- Provision of interactive shell
- Provision of general-purpose interactive graphical interface

## Integration

- Packages to be integrated with UNICORE software releases
- And productised as EUROGRID software releases