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
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

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, ...
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
**Technology Development**
- Satisfy requirements generated by domain-specific grids
- Improve EUROGRID take-up and exploitation in both science and industry

**Efficient Data Transfer**
- Fall-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