GRIP: Interoperability between UNICORE and Globus

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GRIP: GRid Interoperability Project

Funded in part by EU grant IST 2001-32257
Duration: January 2002 – December 2003
Budget: 1.9 Mio €

URL: www.interoperability-project.org

Partners

- Forschungszentrum Jülich, D (Coordinator)
- Pallas GmbH, D
- University of Manchester, UK
- University of Warsaw, PL
- Deutscher Wetterdienst, D
- University Southampton, UK
- Fecit, UK
- Argonne National Laboratory, US

Foils created by partners of the GRIP project
GRIP Partners

UNICORE and Globus

UNICORE Goals

UNICORE: UNiform Interface to COmputing Resources
- conceived prior to the ‘invention’ of the GRID
- UNICORE has both a modest and an ambitious goal:
  - Create
    - Seamless
    - Secure
    - Intuitive
  access to distributed German HPC resources
- Create a system that can be used in production at the German HPC centers

UNICORE Functions
- Creation of system-independent jobs
- Execution at different sites
- Creation of complex interdependent multi-system and multi-site jobs
- Monitoring and control of jobs
- Dependencies
- Workflow
UNICORE Functions

- Transfer of data to and from the workstation
- Automatic data transfer between systems and sites
- Access to data in Unix file systems and archives
- Application support
- No changes to third party applications
- Support for legacy job scripts
- Support for Metacomputing
- Performance analysis using VAMPIR

UNICORE Functions

- Single sign-on
- No changes to local user management and naming conventions
- Secure communication over the Internet
- Support for all platforms, operating systems, and batch systems at partner sites
- Retaining of administrative autonomy and security policies of participating sites

UNICORE Functions

- Continued development and support after the end of the project
- Basis for additional national and international projects
- Production quality prototype

Objectives will be achieved by year end 2002

URL: www.unicore.de

EUROGRID

- European Grid Testbed
- Based on UNICORE technology
- Development of additional UNICORE functions
- Funded in part by EU grant IST-1999-29247
- Duration: November 2000 - October 2003

URL: www.eurogrid.org
**EUROGRID Partner**

- Forschungszentrum Jülich, D
- Pallas GmbH, D (Project Coordinator)
- Parallab - University of Bergen, N
- CNRS - IDRIS, F
- Warsaw University - ICM, PL
- Victoria University of Manchester, UK
- Deutscher Wetterdienst, D
- GIE EADS CCR, F
- ETH Zürich (CSCS Manno), CH
- Fecit, UK
- T-Systems, D

**Globus**

- Development by Argonne National Laboratory and other US partners
- Defines Protocols and APIs for GRIDs
- Toolbox to enable development of GRID aware applications
- Basis for many international Grid projects

**Grid Architecture**

- Application Layer
- Collective Layer
- Resource Layer
- Fabric Layer

- Applications, Portals, Environments
- Higher Services, APIs, Protocols
- APIs, Protocols, SDKs
- Computers, Networks, Devices
Grid Architecture

Application Layer
Collective Layer
Resource Layer
Fabric Layer

Applications, Portals, Environments
Higher Services, APIs, Protocols
Computers, Networks, Devices

Globus

Grid Architecture

Application Layer
Collective Layer
Resource Layer
Fabric Layer

Applications, Portals, Environments
Higher Services, APIs, Protocols
Computers, Networks, Devices

LEGION

Grid Architecture

Application Layer
Collective Layer
Resource Layer
Fabric Layer

Applications, Portals, Environments
Higher Services, APIs, Protocols
Computers, Networks, Devices

UNICORE

Grid Architecture

Application Layer
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UNICORE
GRIP Partners
UNICORE and Globus

**GRIP Objectives**

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GRIP and OSGA

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**GRIP Objectives**

- Develop software to facilitate interoperation between UNICORE and Globus combining the unique strength of each system (Pallas, fecit, UoM, FZJ, ANL)
- Build and demonstrate biomolecular (MD & QC codes) and meteorological (RLM) inter-grid applications (ICM, DWD, SOTON)
- Create wrappers to support commercial applications in a Grid (no code changes)
- Contribute to and influence international Grid standards through the Global Grid Forum

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**Key UNICORE Technologies**

- Seamless Computing Model
  - Job abstraction
  - Incarnation
  - File staging and transfer support
- Security Model
  - X509 certificate based security model
  - Consigner plus endorser model
  - Several CA policies
  - Fully flexible firewall support
- Generic Client
  - No changes to application needed
  - Handy GUI environment
- Portable Server
  - Java + Perl
Parallels and Contrasts

- Resource Description
  - UNICORE: Same model for discovery and request
  - Globus: Different models for discovery and request

- Jobs vs Applications
  - UNICORE: Workflow environment
  - Globus: Application APIs and toolkit

- Security
  - UNICORE: End-to-End security model
  - Globus: Requires transitive trust

- Incarnation and Grounding
  - UNICORE: Incarnation of abstractions at server
  - Globus: Client side grounding (substitution to ‘normal form’)?

- Protocol Complexities
  - UNICORE: Polling (request/response)
  - Globus: Call back

Missing Technologies

- Missing Models in UNICORE
  - Distributed directory services
  - Multi-language Implementations
  - Application level message passing
  - Event management
  - Synchronized job start

- Implementation to be completed in UNICORE
  - Resource reservation
  - Interactive processing
  - Dynamic support for new Vsites on the fly

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UNICORE Architecture

- User Workstation
  - UNICORE GUI
    - HTTP
    - Site List
    - SSL

- UNICORE Server
  - Gateway
  - Network Job Supervisor
  - Target System Interface
  - Batch SubSystem
  - TCP/IP

- UNICORE Site 1
  - UNICORE Site n
UNICORE Architecture

User@Workstation
UNICORE Client
- Job Preparation Agent (JPA)
- Job Monitor Controller (JMC)

Server@Usite
- X.509 User Certificate
- UNICORE Login

Hosts in a Vsite
- batch jobs, status requests, data

Authentication
- Site-specific authentication
- optional firewall

Network Job Supervisor (NJS) (Incarnation/Scheduling)

Incarnation DB

Optional Preferred Site

UNICORE Architecture

Proposed Architecture

Client
- grid-proxy-init plugin

Gateway

(Logical) Globus Usite

Vsite A NJS

Generic Globus IDB

Globus TSI

IDB Maker

Globus IDB

Host A

Host B

Network Job Supervisor (NJS) (Incarnation/Scheduling)

Experience with an early prototype

GRIP Partners
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GRIP Objectives
The GRIP Architecture

GRIP and OSGA
Experience

Simplified Architecture implemented by M. Rambadt as part of his Master thesis:

• No changes to UNICORE or Globus
• Fixed Globus resource as a Visite
• Extended TSI interfaces UNICORE and Globus:
  – To create proxy certificates
  – To map AJO to RSL
  – To acts as Globus client
  – To return results and status from Globus to NJS and Client

→ Proof of concept

Outlook

• First GRIP deliverable (end 2002) will interface UNICORE and Globus 2.0
• Project partners work with GGF on future developments
• OGSA is an important topic
• OSGA will be considered by GRIP project for 2003 (requires agreement by EU)
Outlook

- UNICORE will continue to contribute to Grid developments
- Grid development will benefit from experience gained at UNICORE Test and Production sites
- Accepted standards with proven implementations are essential

Web addresses:

- [http://www.unicore.de](http://www.unicore.de)  
  Information about the project
- [http://www.fz-juelich.de/unicore-test](http://www.fz-juelich.de/unicore-test)  
  Free UNICORE Client Software
- [http://www.unicore.org](http://www.unicore.org)  
  Download for Software + Sources
- [http://www.eurogrid.org](http://www.eurogrid.org)  
  Information about EUROGRID
- [http://www.grid-interoperability.org](http://www.grid-interoperability.org)  
  Information about GRIP