Overview

- **Past**
  - History of UNICORE

- **Present**
  - What is UNICORE?
  - From Project Results to Production Quality

- **Future**
  - Unicore/GS
H. G. WELLS
THE TIME MACHINE
WITH A NEW INTRODUCTION BY GREG BEAR

September 1996
History – How it all began ...

- 3rd September 1996: round table with users, supercomputer centres, competence centres, vendors
  - discussion: “what prevents an efficient use of distributed supercomputers?”
  - results: propose solutions
- December 1996: UNICORE project idea submitted to BMBF
- Spring 1997: UNICORE project proposal developed and submitted to BMBF
- 1st of August 1997: start of the German UNICORE project
  - until 31st of December 1999
  - grant 01 IR 703
Uniform Interface to Computing Resources

Goals
- seamless, secure, intuitive
- use of existing and future-oriented technologies
- no change to existing procedures in the centers
- prototype within two years

Consortium (* without funding, ** joined later)
- developers: Genias, Pallas
- centers: Berlin (ZIB), Jülich (ZAM), Karlsruhe (RUKA), München (LRZ), Stuttgart (RUS)
- competence center: Paderborn (PC²)
- users: DWD, ECMWF*, debis, INPRO*, fecit*
- vendors*: Hitachi**, HP**, IBM, NEC, SGI, SNI/Fujitsu, Sun**
Results

- well defined security architecture with X.509 certificates and extensible security mechanisms (sso)
- intuitive usage via a graphical interface (AWT 1.1.5) and web browser (Netscape 4.05)
- central job supervisor based on Codine from Genias

But

- rudimental application specific support
- no metacomputing support
- only limited number of machines and batch subsystems supported
- no complete product for production with support, involvement of vendors
UNICORE Plus

Goals
- continuation of UNICORE development until December 2002 towards a Grid infrastructure together with a computing portal
- hardening and maturing for operation in production
- integration of new functions
- support for more systems
- deployment at the participating sites

Consortium
- Jülich (FZJ, coordinator), Stuttgart (RUS), Berlin (ZIB), Munich (LRZ), Karlsruhe (RUKA), Paderborn (PC²), Dresden (TUD), DWD, Pallas, fecit

Duration: 1st of January 2000 – 31st December 2002
- grant 01 IR 001
Areas of Development

- Implementation Enhancements
  - replacement of applet by application
  - replacement of Codine by custom NJS
  - replacement of Jigsaw https server by UNICORE Gateway
- Data Management Enhancements
  - fast and secure file transfer, access to archives
- Extended Job Control
  - job chains, workflows, conditional execution (if-then-else)
- Application Specific Interfaces
  - custom build application interfaces, generalized plug-in toolkit
- Metacomputing
- Resource Modeling
A **vertically** integrated Grid middleware system
Provides **seamless, secure, and intuitive** access to distributed resources and data
Used in production and projects worldwide

**Features**
- intuitive GUI with single sign-on
- X.509 certificates for AA and job/data signing
- only one opened port in firewall required
- workflow engine for complex multi-site/multi-step workflows
- extensible application support with plug-ins

- matured job monitoring
- interactive access with UNICORE-SSH
- integrated secure data transfer
- resource management
- full control of resources remains
- production quality, ...
UNICORE Architecture

- Workflow-Engine
- Resource Management
- Job-Monitoring
- File Transfer
- User Management
- Application Support

Hands on
UNICORE-SSH

- Uses standard UNICORE security mechanisms to open a SSH connection through the standard SSH port

UNICORE-SSH button

hands on
What is UNICORE and what is it not?
A Google’s perspective

UNICOREは、グリッドミドルウェアです。クライアントは手元のパソコンにUNICORE Clientをインストールし、UNICOREサーバ上のGatewayにアクセスすることで、グリッド環境を利用することができます。

グリッド環境を提供する人は、デスクトップパソコンやサーバなどにUNICOREサーバのNJS・TSIをインストールし計算機資源とします。そして、Firewall上またはFirewallの外にGatewayを設置し、そこからクライアントにグリッド環境を提供します。
UNICORE Forum e.V.

- Founded by developers, leading European HPC centres, and supporting hardware vendors as a non-profit association
- Tasks
  - foster the distribution and use of UNICORE, organize workshops, support presentations at conferences, publish and maintain the specifications, coordinate further development, certify implementations and extensions
Open Source under BSD license

Supported by FZJ

integration of own results and from other projects

release management

problem tracking

CVS, mailing lists

documentation

assistance

Viable basis for many projects

DEISA, VIOLA, UniGrids, D-Grid, NaReGI

http://unicore.sourceforge.net
From Project Results to Production Usage

Success factor: vertical integration

- different communities
- different computing resources (super computers, clusters, …)
- know-how in Grid middleware
Production Usage at the
John von Neumann Institute for Computing

- About 450 users in 200 research projects
  - ¼ of them uses UNICORE
- Access via UNICORE to
  - IBM p690 eSeries Cluster (1312 CPUs, 8.9 TFlops)
  - Cray XD1 (72+ CPUs)
  - IBM BlueGene/L (2048 CPUs, 5.7 TFlops)
Workflow Automation & Speed-up

- Automate, integrate, and speed-up drug discovery in pharmaceutical industry
This script was created and executed by Unicore.

UNICORE - start of user output on stdout

Wed Sep 28 09:33:46 CEST 2005

linux x86_64 2.6.16-44.16-smp #1 SMP Thu Jun 2 12:20:49 UTC 2005 i686 i686 i386 GNU/Linux

printenv | grep GLOBUS

GLOBUS_LOCATION=/opt/globus/gt2_g_4
GLOBUS_GANG_DYN_CONTACT=unix:/xen461.xen.kit-juelich.de:40185/
GLOBUS_GANG_JOB_CONTACT=unix:/xen461.xen.kit-juelich.de:40187/21951/1127894026/

UNICORE - end of user output on stdout

hands on
Goal

- deploy and operate a persistent, production quality, distributed, heterogeneous, and multi-terascale supercomputing environment
- UNICORE is used as production Grid middleware
Workflow Application with UNICORE
Global Data Management with GPFS

Job-workflow:
1) FZJ
2) CINECA
3) RZG
4) IDRIS
5) SARA

hands on
UNICORE Usage in other Projects

- UNICORE as basic middleware for research and development
- Development of UNICONDORE interoperability layer (UNICORE ↔ CONDOR)
- Access to about 3000 CPUs with approx. 17 TFlops peak in the NaReGI testbed

Integration Project

- UNICORE is used in the Core-D-Grid Infrastructure
- Development of tools for (even) easier installation and configuration of client and server components
Broader vision of interoperability between different Grid middleware infrastructures needed

Goals

- develop next generation of UNICORE called Unicore/GS based on OGSA and compliant with WSRF
- develop generic software components for visualization and steering, device monitoring and control, and access to distributed data and databases
- matured NJS functions are transformed into Atomic, Advanced, and Higher Level Services and Client Frameworks
- actively influence upcoming Grid and Web Services standards
UniGrids

Uniform Access to Grid Services

Unicore/GS Architecture
- Unicore Component
- New Component
- Web Services Interface

UniGrids Portal
OGSA Server A
OGSA Server B
OGSA Client
Unicore Gateway
Network Job Supervisor
Resource Broker
Resource Database
UniGrids Portal

Access Unicore Components as Web Services
Integrate Web Services into the UNICORE workflow
From Production UNICORE to Unicore/GS

Network Job Supervisor

Gateway + Service Registry

Client
Portal
Command Line

WS-RF
WS-RF
WS-RF
WS-RF
WS-RF
WS-RF
Summary

- establishes a seamless access to Grid resources and data
- designed as a vertically integrated Grid Middleware
- provides matured workflow capabilities
- used in production at NIC and in the DEISA infrastructure
- available as Open Source from http://unicore.sourceforge.net
- used in research projects worldwide
- continuously enhanced by an international expert team of Grid developers
- currently transformed in the Web Services world towards OGSA and WSRF compliance