Objectives and Research Focus

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Grid Research and Deployment in FP6

Grid Technologies
- Architecture, design and development of the next generation Grid
- Enabling application technologies
- Industrial and business applications

Research & Development

Technology-oriented strategic objectives
- e.g. semantic web, software and services

130 M€ (IST)

R&D

Research Infrastructures
- Deployment of specific high performance Grids
- Deployment of high-capacity and high-speed communications network - GEANT

Deployment
200 M€ RI

Application-oriented Strategic Objectives
- e.g. eBusiness, eGov, eHealth, environment & risks management
OUTLINE

⇒ The EU Research Infrastructures programme in 2003 - 2006

⇒ EU Grid Research in 2003 - 2006

⇒ Concluding remarks

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⇒ Enabling application technologies
⇒ Industrial and business applications

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Research Infrastructures
⇒ Deployment of specific high performance Grids
⇒ Deployment of high-capacity and high-speed communications network - GEANT

Deployment
200 M€ RI
Major projects

- **GÉANT INFRASTRUCTURE**: Pan-European Research Network (€93M - DANTE)
- **OMII-Europe**: SW interoperability (€5M - SOTON)
- **EGEE-II**: Cluster grid (€37M - CERN)
- **DEISA**: Supercomputer grid (€15M - CNRS)
Pan-European coverage (40+ Countries/NRENs)
Dark fiber wavelength and Gigabit connectivity at 10 Gb/s
Linking more than 3900 Universities
30+ Million Students
Total 200 MEuro over 4 years (93 MEuro from EU)
Extend to Mediterranean, Asia Pacific Rim, Latin America ...
eInfrastructure: better connectivity

EUROLabs
(connected testbeds)

LOBSTER  MUPPED
(traffic monitoring) (optical tech.)

EUQoS  GO4IT
(flexible QoS) (IPv6 testing)

Technology validation

SEEREN2/SEEFIRE  PORTA OPTICA
(Balkans) (Caucasus)

ORIENT  TEIN2  ALICE
(China) (Asia) (Latin America)

OCCASION  EUMEDCONNECT
(NIS) (Mediterranean)

Geographical extension

User involvement

AUGERACCESS IPv6TF SC
(cosmic rays) (IPv6 take up)

6DISS  EXPReS
(IPv6 widespread) (astronomy)
EGEE: 20 applications from 6 scientific domains

- **High Energy Physics**
  - 4 Large Hadron Collider experiments (CERN)
  - Other HEP (DESY, Fermilab, etc.)

- **Biomedicine**
  - Bioinformatics
  - Medical imaging

- **Earth Sciences**
  - Earth Observation
  - Solid Earth Physics
  - Hydrology
  - Climate

- **Computational Chemistry**

- **Astronomy**
  - Cosmic microwave background
  - Gamma ray astronomy

- **Geophysics**
  - Industrial applications
EGEE: world’s largest multi-science grid

Snapshot 4Q 2006

- >200 sites
- >30 000 CPUs
- ~30 000 jobs successfully completed per day
- 100 Virtual Organisations
- >2000 registered users, representing several 1000s of scientists
eInfrastructure: expanding the Grid

New regions

- ICEAGE (education)
- ITHANET (clinical)
- BELIEF (support)
- EELA (Latin America)
- BalticGrid (Baltic)
- SEEGRID (SEE)
- BIOINFOGRID (bioinformatics)
- DILIGENT (digital libraries)
- EUChinaGRID (China)
- EUMEDGRID (Mediterranean)

New user communities

- ICEAGE (education)
- ITHANET (clinical)
- BELIEF (support)
- EELA (Latin America)
- BalticGrid (Baltic)
- SEEGRID (SEE)
- BIOINFOGRID (bioinformatics)
- DILIGENT (digital libraries)
- EUChinaGRID (China)
- EUMEDGRID (Mediterranean)

Making it better

- ISSeG (security)
- ETICS (software testing)
- GRIDCC (instrumentation)

Supporting policy making

- eIRGSP (eIRG)
DEISA: the supercomputing grid

- Integrates Europe’s most powerful supercomputers
- Multiple application areas + DEISA Extreme Computing Initiative

High bandwidth (up to 10 Gbit/s)

≠ Operating Systems
≠ Architectures
DEISA: bringing together major EU supercomputing systems.

**AIX IBM domain**
- RZG (DE)
- IDRIS (FR)
- ECMWF (UK)
- CSC (FI)
- CINECA (IT)
- FZJ (DE)

**LINUX SGI**
- SARA (NL)
- LRZ (DE)

**High Performance Common Global File System**

**LINUX Power-PC**
- BSC (ES)
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130 M€ (IST) for Research & Development
200 M€ RI for Deployment

Information Society and Media Directorate-General – European Commission
Unit Grid Technologies
3rd Grid@Asia workshop – Seoul, 11-13 December 2006
Objectives of Grid Research in FP6

- Exploit the potential of Grids beyond eScience
- Solve complex problems with high economic and societal impact
- Advance Grid technologies, systems and architectures
- Ease access and use of Grids
- Promote international cooperation and standardisation

Industries & Business

Grids

eScience
Grid Strategy towards the Lisbon Objectives

- Leadership
- Competitiveness
- Addressing standardization, regulation, ...
- Innovation framework to increase adoption
- Aligning business and research agendas

- Developing new methods, tools, systems and services
- Advance excellence and know-how
- Long-term and business-driven R&D
- Integration – structuring – standardisation

Coordination of National Programmes
Opening-up of National Programmes
International cooperation
Build critical mass
Derive standardisation strategy

Research & Development

European Research Area
Technology Platform

Leadership
Competitiveness
Addressing standardization, regulation, ...
Innovation framework to increase adoption
Aligning business and research agendas

Developing new methods, tools, systems and services
Advance excellence and know-how
Long-term and business-driven R&D
Integration – structuring – standardisation
Calls for proposals in FP6 – Grid Technologies

EU funding: 130 M €

Grid-enabled Applications & Services for business and society
Research, development, validation and take-up of generic environments and tools

Grid Foundations
Architecture, design and development of technologies and systems for building the invisible Grid

Network-centric Grid Operating Systems
Potential new fabric layer for future distributed systems and services


Applications Push: Advanced Grid Technologies, Systems and Services

Application Sector 1
Application Sector 2
Application Sector 3
Application Sector n
Grid Research Projects under FP6

EU Funding: 130 M€

trust, security

Platforms, user environments

CoreGRID virtual laboratories

SIMDAT industrial simulations

BeinGrid business experiments

Supporting the Grid community

International cooperation

Grid services, business models

data, knowledge, semantics

Platforms, user environments

Specific support action

Integrated project

Network of excellence

Specific targeted research project

Wave 2 – start 2006

Wave 1 – start 2004

Information Society and Media Directorate-General – European Commission
Unit Grid Technologies
3rd Grid@Asia workshop – Seoul, 11-13 December 2006
Objectives
- Build S&T excellence on Grid - EU-wide virtual laboratory
- Achieve sustainable restructuring and integration
- Disseminate EU research on Grid
- Set-up a think-tank to create spin-off projects
- Create the European “Grid Lighthouse”

Research Focus
- Knowledge and data management
- Programming models
- System architecture
- Resource management
- Scheduling
- Problem solving environments

European Research Network on Foundations, Software Infrastructures and Applications for Large Scale Distributed, Grid and Peer-to-Peer Technologies

6 EU Virtual Institutes

42 Partners

Information Society and Media Directorate-General – European Commission
Unit Grid Technologies
3rd Grid@Asia workshop – Seoul, 11-13 December 2006
Main Research and Development Areas:
- Grid architecture
- Foundations & core services
- Dynamic federation and VO
- Grid business models
- Reference implementations
- Standards and applications

Main Application Areas:
- Data mining legal sector
- Broadcasting and entertainment
- Financial modelling
- Digital media
- Supply chain management

Next Generation Grid services architecture for business and industry

Research org.:
- EPCC
- FZJ
- KTH
- QUB
- CNR-ISTI

Technology providers:
- Grid Systems
- HP
- Microsoft

Service providers:
- Fujitsu
- BT
- T-Systems
- Datamat

Application developers / users:
- SAP
- First derivatives
- Kino
Grid Solutions for Complex Problems in Industry

1. Grid-enabled data integration across administrative domains
2. Grid-powered collaboration across manufacturers and suppliers
3. Novel analysis and knowledge discovery services exploiting Grid connectivity

Industrial example

Grid Technologists
- IBM
- NEC
- Intel
- IT
- Oracle
- Universität Karlsruhe (TH)

Capability Providers
- ESI Group
- InforSense
- MSC Software
- Ontoprise
- Lion

Automotive
- pharmaceutical
- Aerospace
- Meteorology

End Users
- gsk
- Audi
- EUMETSAT
- METEO FRANCE
- BAE SYSTEMS
- EADS
- Daimler Chrysler
- Renault
- Renault
- Met Office

Information Society and Media Directorate-General – European Commission
Unit Grid Technologies
3rd Grid@Asia workshop – Seoul, 11-13 December 2006
1. Successful installation of Grids including integrated access to distributed data repositories in seven industrially led prototypes
2. Grid technology development on collaboration to be deployed in the next phase prototypes
3. One prototype already fed into a new product: Grid-based integration environment for the automotive industry decided to be deployed at AUDI and transferred to SEAT in 2007.
IP BEINGRID aims to exploit European Grid middleware by creating a *toolset repository of Grid services* from across the Grid research domain and to use these services to deliver a set of *18 business experiments* that stimulate the early adoption of Grid technologies for provisioning of services across the EU.

75 partners across the value chain of technology & service providers and users in diverse industrial sectors such as automotive, aerospace, ship building, finance, retail, logistics, new media, textile, environment, public services, …
Networked European Software and Services Initiative

A European Technology Platform for SW, Grids & e-Services:

Mission:
Develop a visionary strategy for Software, Grids and Services driven by a common European Research Agenda where innovation and business strengths are reinforced

www.nessi-europe.com
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Concluding remarks (I)

- **GEANT2: Connecting Europe and beyond**
  - Better connectivity
  - User involvement

- **eInfrastructure: expanding the Grid**
  - New user communities
  - New regions
  - Improved technologies
Concluding remarks (II)

- Evolution of the Grid vision towards Service Oriented Knowledge Utilities (SOKU)
  - 2003: virtualisation, simplicity
  - 2004: mobile Grids & NC-OS
  - 2005/06: Convergence of Grid-web services ⇒ SoA/SOKU

- 130 M€ EU funding for 36 projects ⇒ longer-term research + industry orientation

- Building strong European industrial commitment
Further Information

• **Brochure: From Grids to Service-Oriented Knowledge Utilities**
  - FP6 Grid Project Fact Sheets and Interim Achievement Sheets

• **Workshop and Expert Group Reports**
  - “Next Generation Grids 3 – Grids and service oriented knowledge utilities: vision 2010 and beyond”, publication expected February 2006

and more: [cordis.europa.eu/ist/grids](http://cordis.europa.eu/ist/grids)

• **Research Infrastructure web site:**
  - [cordis.europa.eu/ist/rn/home.html](http://cordis.europa.eu/ist/rn/home.html)

• **FP7:** [cordis.europa.eu/fp7/](http://cordis.europa.eu/fp7/)