The KnowARC Project

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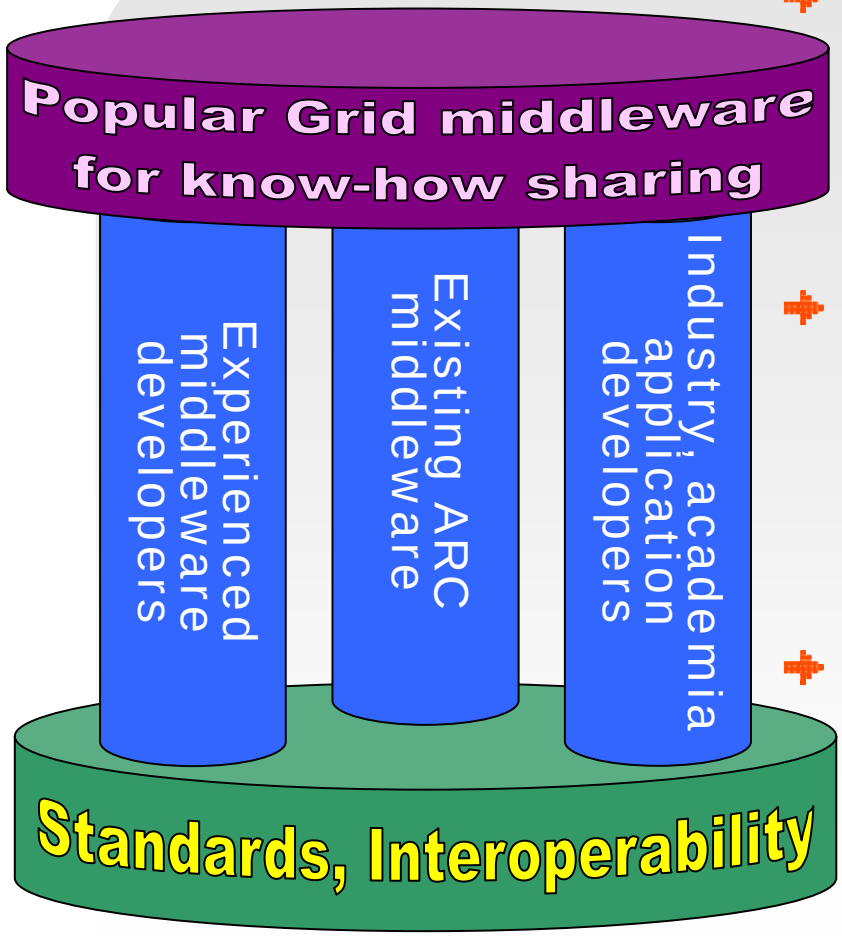
Goals of KnowARC



The mission of KnowARC is

- **to create a novel, powerful Next Generation Grid middleware**
  - **extend and re-design ARC**
  - **ARC in major Linux distributions**
  - **New platforms: Windows, Solaris, Mac OS-X**
- **to promote Grid standardization and interoperability**
  - **interoperability with other Grid solutions (EGEE and GGF compliant grids)**
  - **possibilities to include (or to be included in) other infrastructures.**
- **to prove usage in Health care, Industry and Science, and increase awareness about Grids in these sectors**
  - **Bioinformatics: Autoimmune Diseases**
  - **Medical Informatics: Lung Diseases**
  - **Automotive industry**

Official Project information

KnowARC

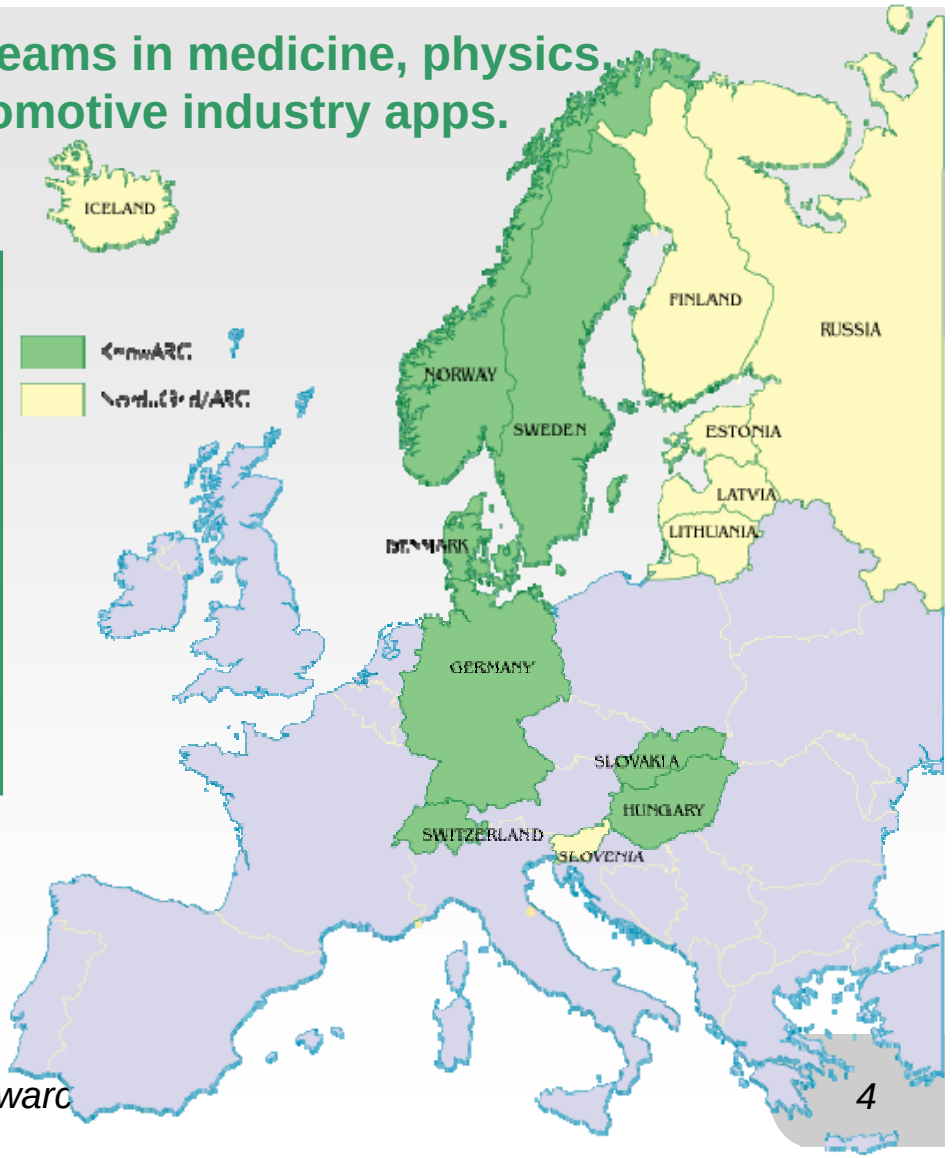
Title of Contract: Grid-enabled Know-how Sharing Technology Based on ARC Services and Open Standards
Acronym: KnowARC
Contract Nber: 032691
Instrument: STP - Specific Targeted Research Projects (aka STREP)
Thematic priority/domain: Information Society Technologies (IST)
Call title: IST Call 5
Call identifier: FP6-2005-IST-5
Activity: IST-2005-2.5.4 - Advanced Grid Technologies, Systems and Services
Program: FP6
Duration: 36 month
Start date: June 1, 2006
Community Contribution: EUR 2 899 494:-
Resources: 17.5 FTEs in total, 12.5 financed
Coordinator: University of Oslo
Contact: Prof. F. Ould-Saada

10 partners, 7 countries

KnowARC

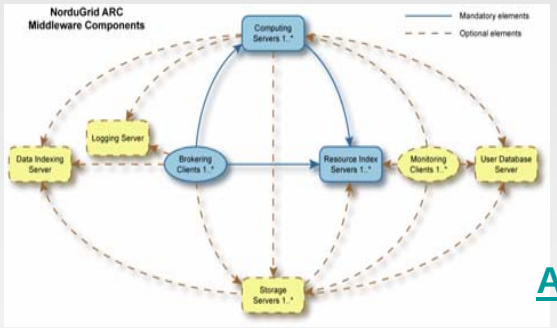
NorduGrid members and research teams in medicine, physics, bioinformatics, IT, engineering, automotive industry apps.

Oslo University	Norway
Lund University	Sweden
Copenhagen University	Denmark
Uppsala University	Sweden
NIIF	Hungary
Geneva Uni. Hospitals	Switzerland
Kosice University	Slovakia
Lübeck University	Germany
science+computing ag	Germany
SUN Microsystems	Hungary



Why further develop ARC

- Lightweight standalone client package, easy to install and use
- Reliable resource for scientific applications in many research fields
- Available on a wide range of Linux platforms
- Non-centralised architecture



ARC middleware architecture

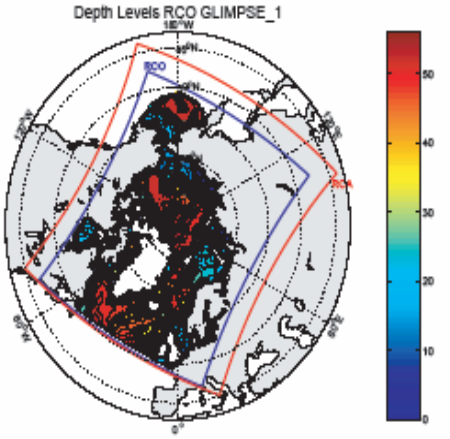
- Needs no centralized operations infrastructure
- Non-intrusive, coexists with other softwares and configurations

- See Top 10 Reasons to Use ARC for more details

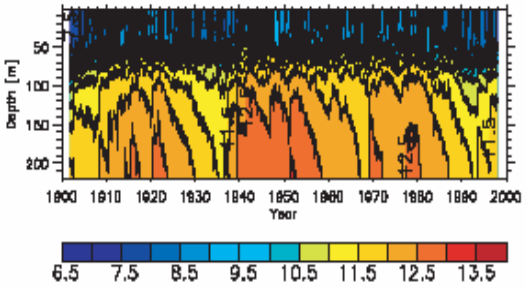
- suits heterogeneous distributed shared resources
- Is in many spects interoperable with other middlewares

Non HEP applications dominate even during CERN data challenges. These include biomedical sciences (e.g. genome research), geophysical science (climate research), material science (solid state and quantum chemistry research), space science, …

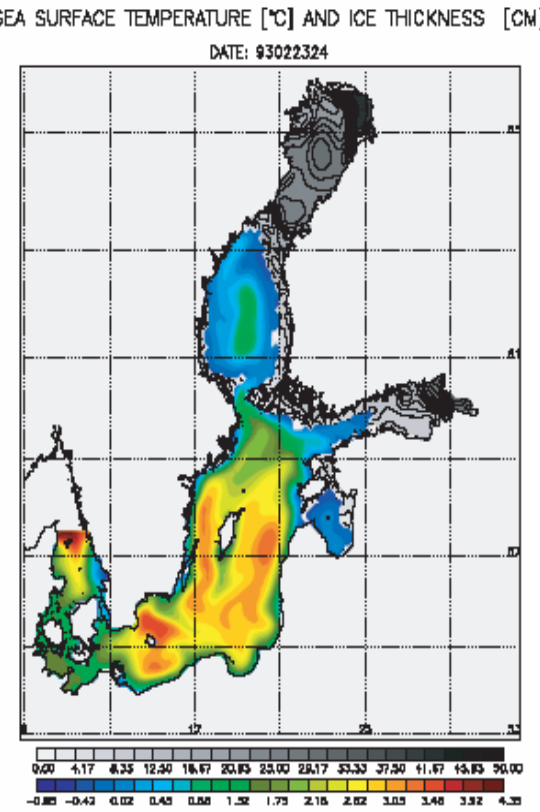
Regional climate analysis and modelling (*SWEGRID*)



Development of a coupled regional climate model for the Arctic.



Salinity for the eastern Gotland basin as function of time and depth.

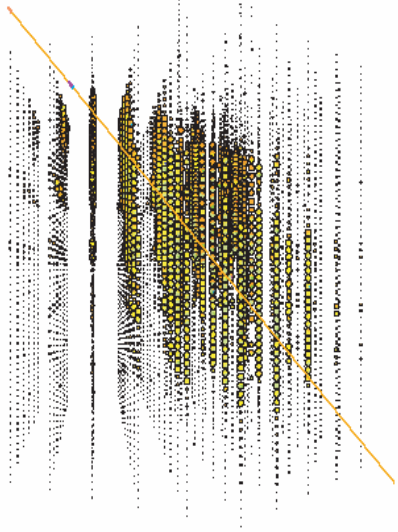


Sea surface temperature (in °C) and mean ice thickness (in cm) from 23 February 1993 calculated with the Rossby Centre coupled ice-ocean model.

Pictures: courtesy of H.E.M. Meier, Rossby Centre, SMHI.

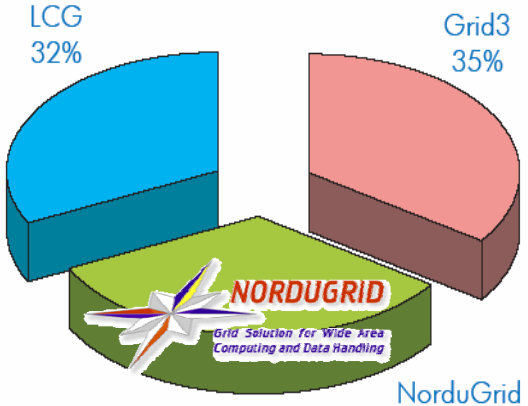
Example of applications run simultaneously on NorduGrid

IceCube detector simulation (*SWEGRID*)



Simulation of a 20 EeV neutrino induced muon passing the IceCube detector.

Picture: courtesy of S. Hundertmark, IceCube experiment.



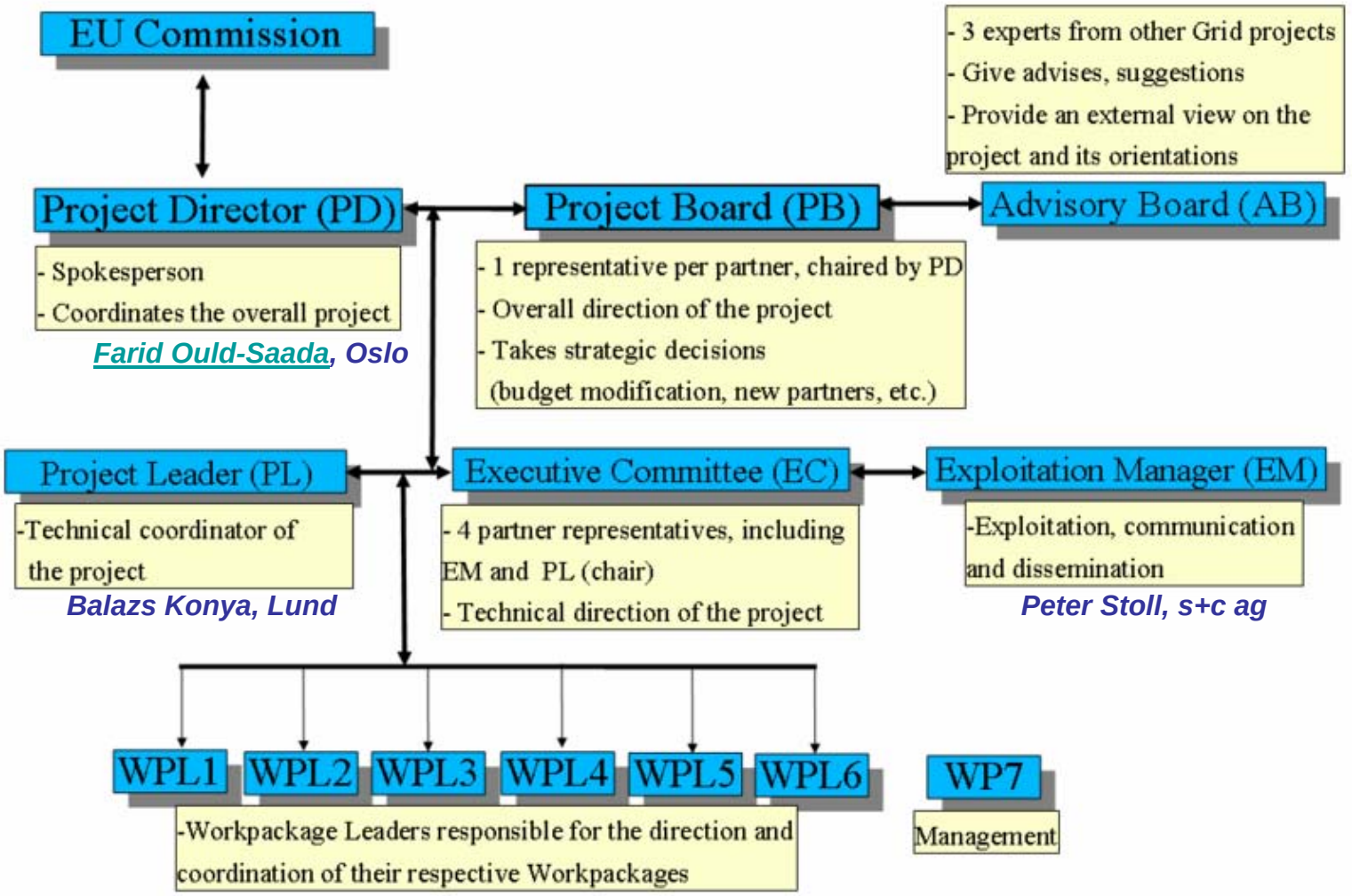
Share of jobs for different Grid systems in ATLAS Data Challenge 2 (2004).

Partner Matrix

KnowARC

Partner name	Role	Person month as % of total
University of Oslo (NO)	**Project Coordinator, WP1 leader, research & development**	**15.8**
Lunds Universitet (SE)	**Technical Coordinator, research & development, operation, standardization**	**11.4**
University of Copenhagen (DK)	**WP5 leader, research & development, interoperability, software distribution, policies**	**10.3**
Uppsala University (SE)	**Research & development, interoperability**	**10.1**
Office for National Information and Infrastructure Development, NIIF (HU)	**WP2, WP3 leader, research & development, interoperability, policies**	**17.9**
University of Geneva (CH)	**Medical informatics application expert, user, public sector exploitation**	**8.3**
Pavol Jozef Šafárik University in Košice (SK)	**Deployment, quality assurance, testing & operations, theoretical research**	**8.6**
Universität zu Lübeck (DE)	**WP4 leader, Bioinformatics application expert, user, integration**	**9.0**
science + computing (DE)	**WP6 leader, development, automotive industry application expert, industry sector exploitation**	**5.8**
SUN Microsystems Hungary (HU)	**Development**	**2.8**

Management structure

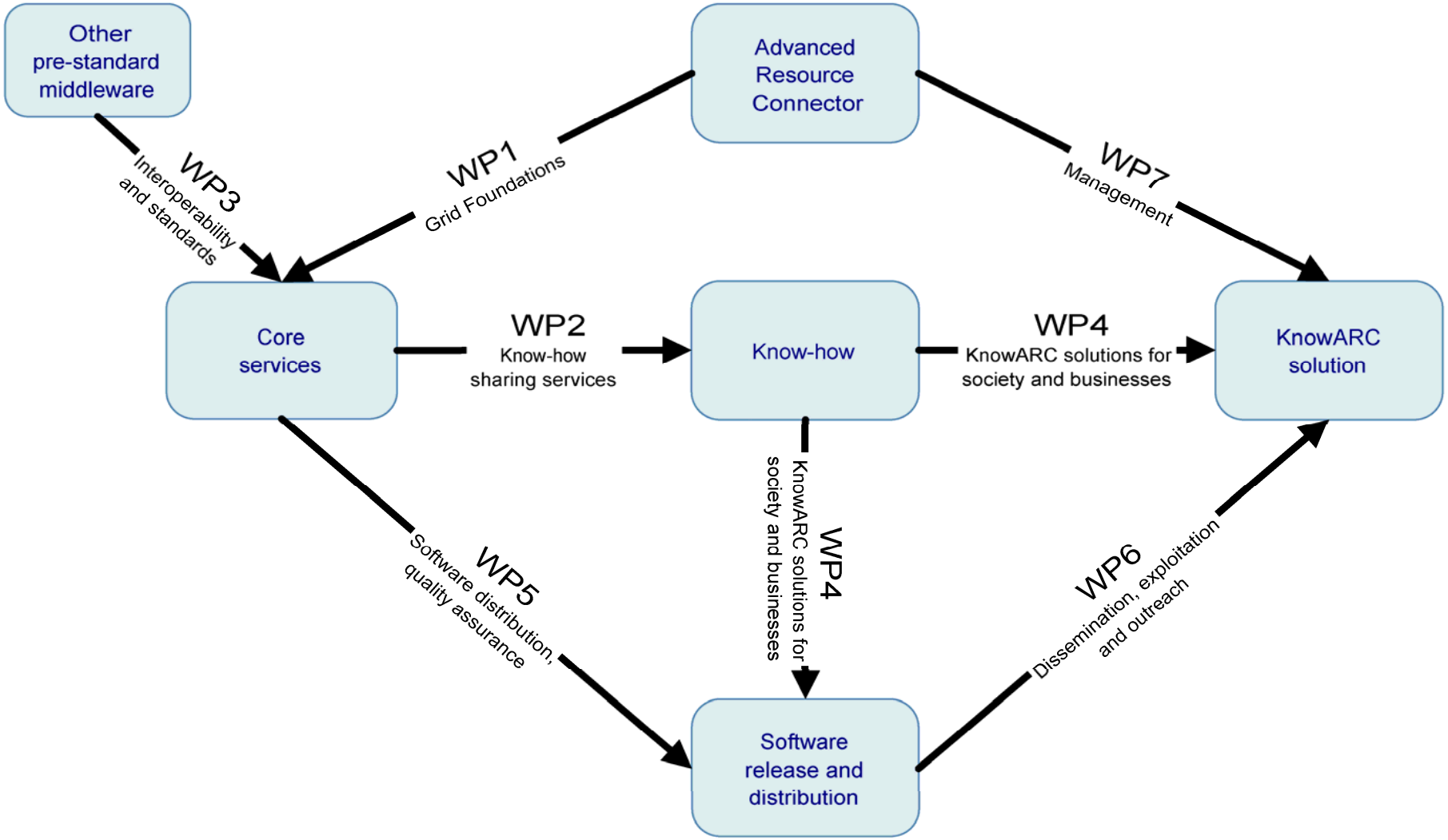


From ARC to KnowARC services

KnowARC

- **WP1** "*Grid Foundations*" creates the new service oriented structure from the current NorduGrid/ARC middleware and
- **WP2** "*know-how sharing services*" adds higher level "*know-how sharing services*" to the core services.
- **WP3** "*Interoperability and highway to standards and policies*" enables integration with other middlewares such as gLite of EGEE and other OGF compliant Grids
- **WP4** "*KnowARC Solutions for Society and Businesses*" utilises the know-how services and adds application domain solutions.
- The core services are tested, certified and packaged into easily installed distributions in **WP5 "***Software distribution, Quality assurance*"
- **WP6** ensures "*dissemination, exploitation and outreach*" activities.
- During the entire project **WP7** takes care of the project *"management".*

Workflow in KnowARC: approach and structure of Work Packages



Innovation and Challenges

KnowARC

- **Challenges**
  - Usability issues for non-expert users
    - Simple to install and use, non-invasive both at server and client sides, portable to a wide platform range (Linux, Windows, Solaris and MacOS-X)
    - No need for centralised operations infrastructure
    - suitable for academic, public and industry sector.
  - Security concerns in sensitive fields
    - Virtualization & sandboxing
  - Provision of Service Oriented Architecture-based system with focus on outstanding performance
    - Creation of proper public interfaces enabling SOA
  - Working in the era of volatile/emerging standards
  - Interoperability with other Grid solutions (EGEE and OGF compliant grids)
    - possibilities to include (or to be included in) other infrastructures.
- **Innovation**
  - Distribution as part of standard Linux distributions
  - Fully non-centralised architecture
  - Combining Grid-core with application development
  - Creation of complex grid services for applications
    - End-user solutions for automotive industry, biomedical and health

KnowARC development plan

KnowARC

- Core Services
  - Next generation Grid middleware architecture survey and design
  - Web Service interfaces over ARC services
  - Back-ends
  - Sandboxing & virtualization
  - Security framework (delegation)
- Higher level services
  - Self-healing flexible storage and user-friendly storage interface
  - Self healing grid jobs: job migration & job manager
  - P2P-like information backbone, novel brokering approaches
  - Scalable accounting service
  - Dynamic application framework management
  - ARC-enabled Taverna and flowGuide (workflow engines)
- Standards & Interoperability
  - OGSA
  - gLite gateway
- Applications
  - Automotive industry
  - Medical image processing
  - Statistical genomics
  - Engineering portal (construction industry)
- Quality assurance, software distribution
  - Build system, testing, support
  - Profiling, performance analysis, usability studies
  - Pilot Grid system
  - ARC in major Linux distributions
  - New platforms: Windows, Solaris, Mac OS-X

Status of the Project …

ARC design week, Budapest 4-8.9.2006

Working hard …

… and having fun!

- Deliverables:
  - D5.6-1 CVS repository, bug tracking system, help-desk and download area in place, NG-KU, 08/09 06
  - D3.3-1 OGSA Conformance Roadmap, NG-LU, 09/10 06
- Milestones:
  - M7.1 “Completed Project staffing” … almost…