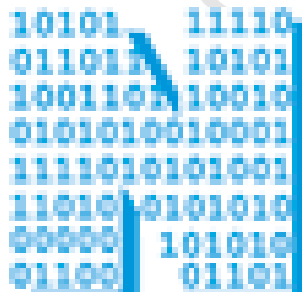


# Open Workshop on e-Infrastructures

Nordic Grid and Networking: NDGF and NORDUnet

Michael Grønager, PhD  
NDGF Technical Coordinator

Helsinki, Wednesday the 4<sup>th</sup> of October 2006



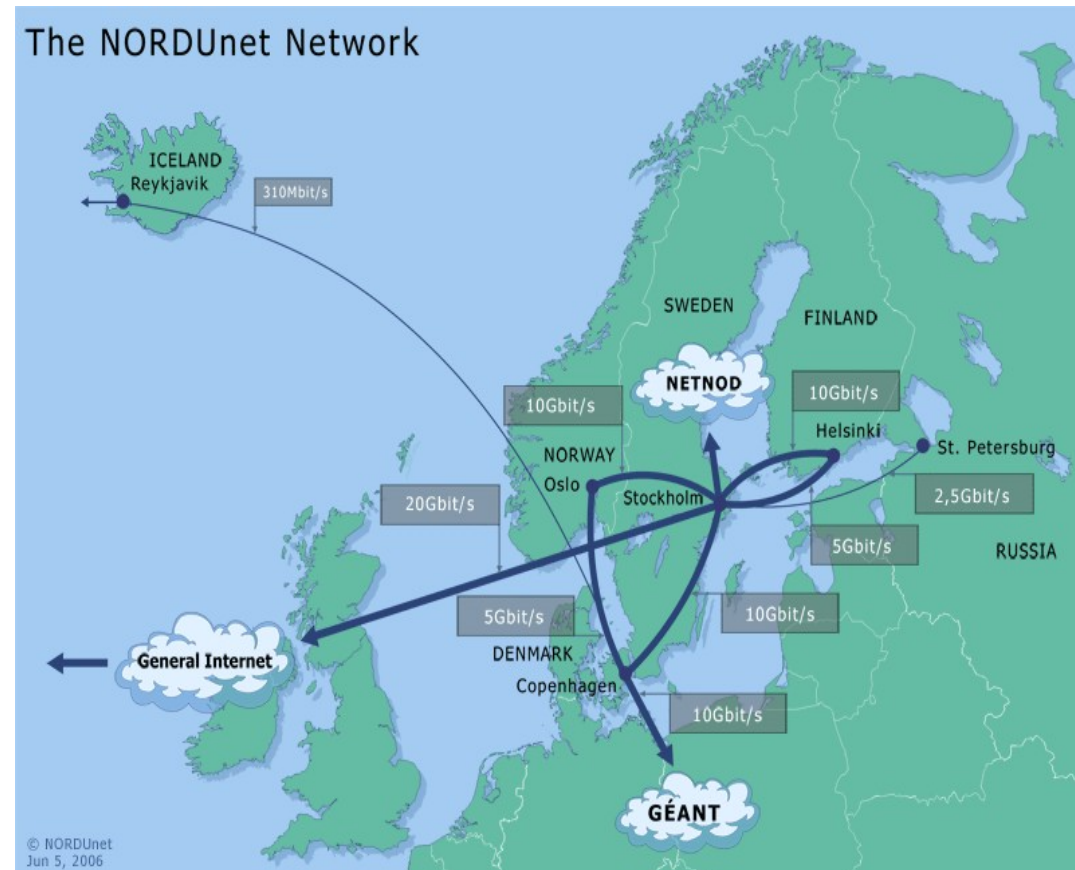
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# Outline

- NORDUnet A/S
- Nordic Grid History
  - EDG, NorduGrid
  - NDGF
  - KnowARC
- e-Infrastructure perspectives and outlook

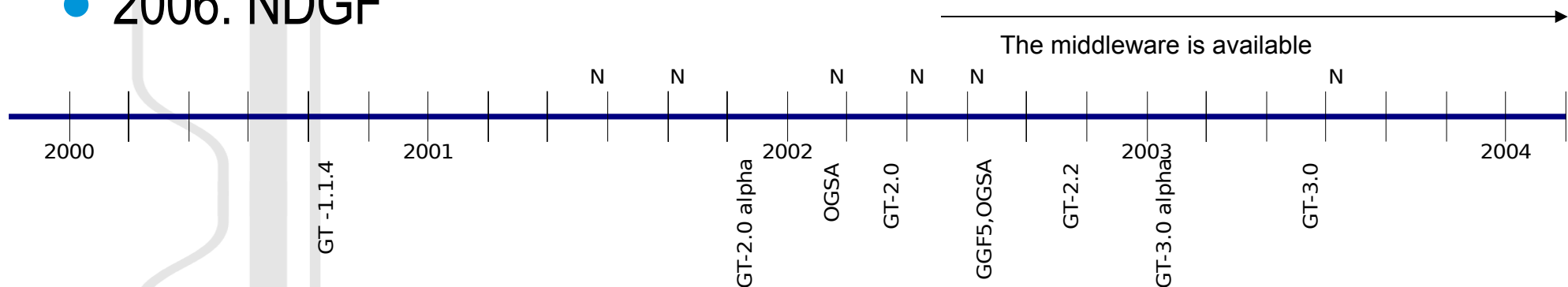
# NORDUnet A/S

- Nordic Regional Research and Education Network (RREN)
- Co-funded by the Nordic Countries
- Interface to international networks (GEANT, GLORIAD etc)



# Nordic Grid History

- 2001: NorduGrid project starts – to collaborate with EDG
- 2002: Decision to create own middleware
- 2002: First testbed operational
- 2003: NDGF (Pilot)
- 2006: KnowARC
- 2006: NDGF



# NorduGrid

- 2001-2002: a research project of the NORDUnet2 program aimed to enable Grid the Nordic countries
- Since end-2002 is a research collaboration between Nordic academic institutes
- Open to anybody, non-binding
- Since end-2003 focuses on middleware
- Develops own Grid middleware: the Advanced Resource Connector (ARC)
- Provides middleware to research groups and national Grid projects
- ARC is now installed on ~50 sites (~5000 CPUs) in 13 countries all over the World







**Members, associated partners and contributors**

- University of Oslo
- Copenhagen University
- Lund University
- Uppsala University
- Helsinki Institute of Physics
- Linköping University
- Umeå University
- University of Bergen
- P.J. Šafárik University in Košice
- Aalborg University
- University of Southern Denmark
- University of Melbourne
- Jožef Stefan Institute
- National Institute of Chemical Physics and Biophysics
- Tartu University
- University of Bern
- Norwegian University of Science and Technology
- Royal Institute of Technology
- St. Petersburg State University
- Finnish IT Center for Science
- JINR University Centre

**NorduGrid** is a collaboration established by five Nordic academic institutes with the purpose of pursuing Grid technology research. The collaboration is at the core of a worldwide Grid Research and Development community that develops, maintains and supports a free Grid middleware, known as the Advanced Resource Connector (ARC).

The aim is to deliver a fault-tolerant, scalable, portable, light-weight and yet fully featured solution for a global computational and data Grid system. This set of tools and services developed by NorduGrid comprises the ARC middleware. ARC is an Open Source software, available for a wide range of Linux systems.

**The goals**

- ❖ Develop and support ARC middleware
- ❖ Coordinate contributions to the core ARC code
- ❖ Define strategical development directions following the latest tendencies in Grid technologies
- ❖ Promote ARC middleware solutions in such areas as Grid development, deployment and usage
- ❖ Contribute to development and spread of world-wide Grid standards

# The NorduGrid Collaboration

From ...



To

- EDG
- Tesbed
- HEP
- 4 Nordic
- 20 cpu's
- 2001



- >ARC
- >50 sites
- +Bio,Chem.,...
- >13 countries
- >5000 cpu's
- >2003



**... from a research project to a research collaboration**  
**...from a Grid testbed to a major middleware provider**  
**NOT an infrastructure, does not operate or control resources**

# NDGF pilot phase

- Deployment project
- Get all Nordic Supercomputer sites on the Grid
- Provide application demos from various areas
- Ended 2004
- Reviewed 2005
- Resulted in the new NDGF

# NDGF Vision

- To *coordinate and facilitate* the creation of a Nordic e-Infrastructure sharing platform
- To enable Nordic researchers to participate in huge international projects
- To optimize and standardize use of resources
- To be the interface between international projects and Nordic researchers



# NDGF

- Hosted by NORDUnet – same CEO
- Budget of 2MEUR/year
- Funded by the Research Councils of Denmark, Finland, Norway and Sweden
- Different Board than NORDUnet
- Advisory Board pr supported project

# NDGF

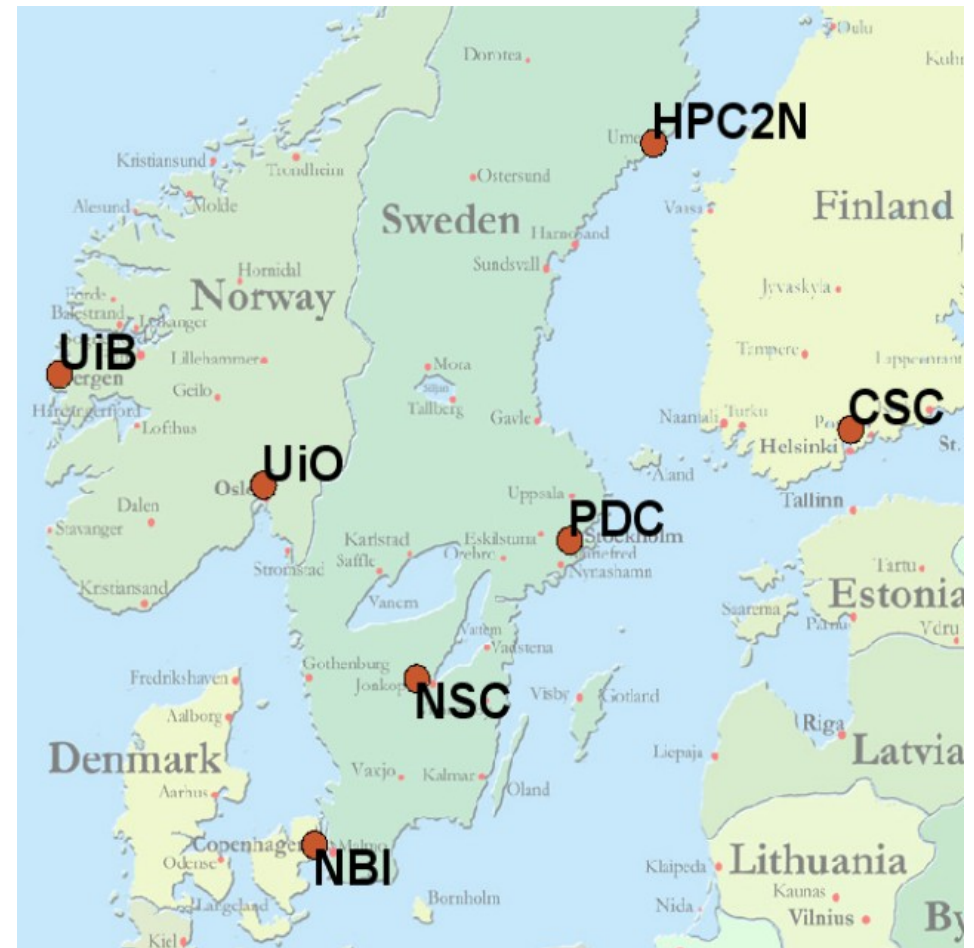
- Organizational:
  - CEO and Development Manager from NORDUnet
  - Technical Coordinator
  - Middleware Coordinator
  - Project Coordinators:
    - CERN Coordinator
    - ...
  - National Node Coordinators (DK, FI, NO, SE)
  - Middleware developers (about 6FTEs)

# NDGF

- Resources
  - Shared between different user groups
    - Currently less than half of all Nordic grid jobs is HEP
  - Also used by local users
- Middleware
  - ARC
  - Interoperability with other M/W.

# The NDGF Tier-1

- Up to 7 sites will participate
- All VOs supported at all sites
- SLAs between NDGF and national e-I bodies.



# KnowARC



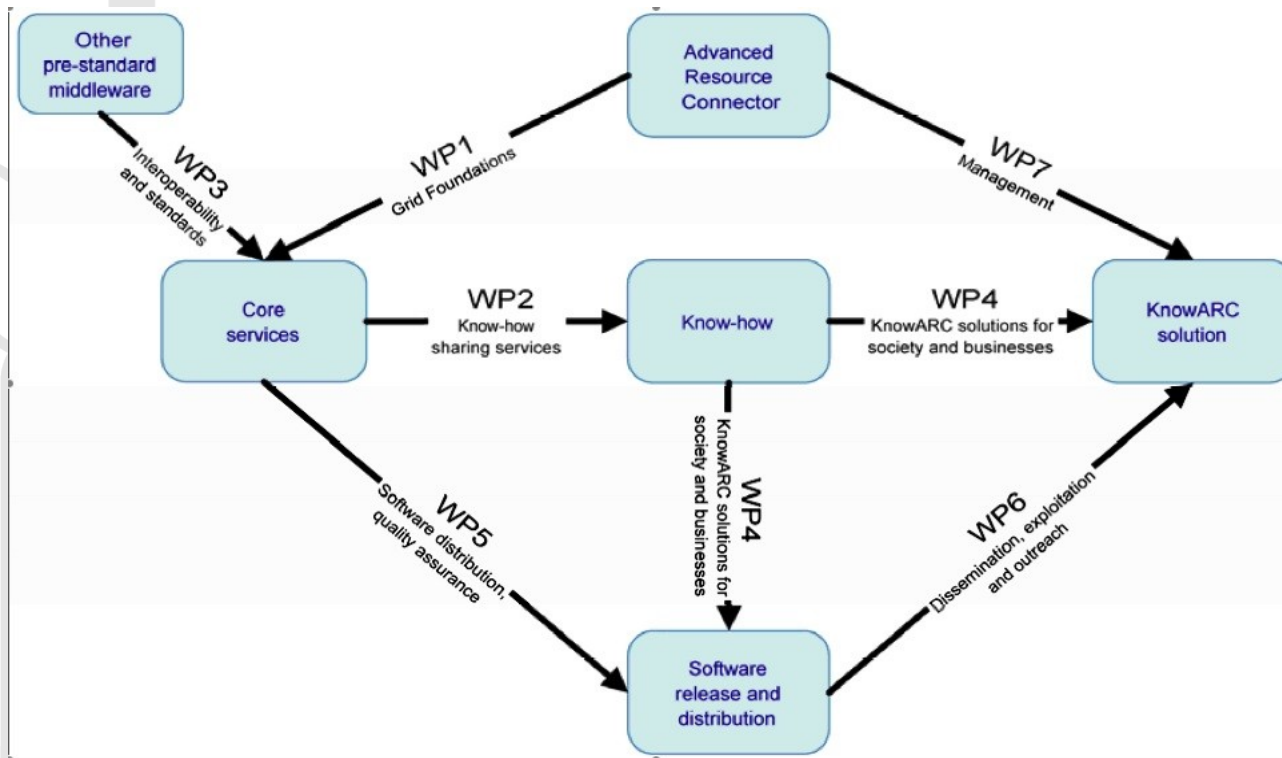
KnowARC

- Sixth Framework Programme Project
- A Specific Targeted Research Project (STREP)
- Funding: 3M EUR
- 10 partners
- Start June 1<sup>st</sup> 2006



# KnowARC

- Overview



# KnowARC and NDGF

- Will be the primary contributors to the ARC middleware
- Are Coordinated through the the NorduGrid collaboration
- Will face grid deployment issues ranging from huge international project like the WLCG to collaborations between a few small research groups

# e-Infrastructure perspectives

- NDGF is currently building up a Nordic e-Infrastructure:
  - For research
  - For education
- NDGF is only *facilitator* and *coordinator* **not** *resource owner*.
- Need to leverage cross organizational collaborations
- Also for the rest of Europe



# Research e-Infrastructure Challenges

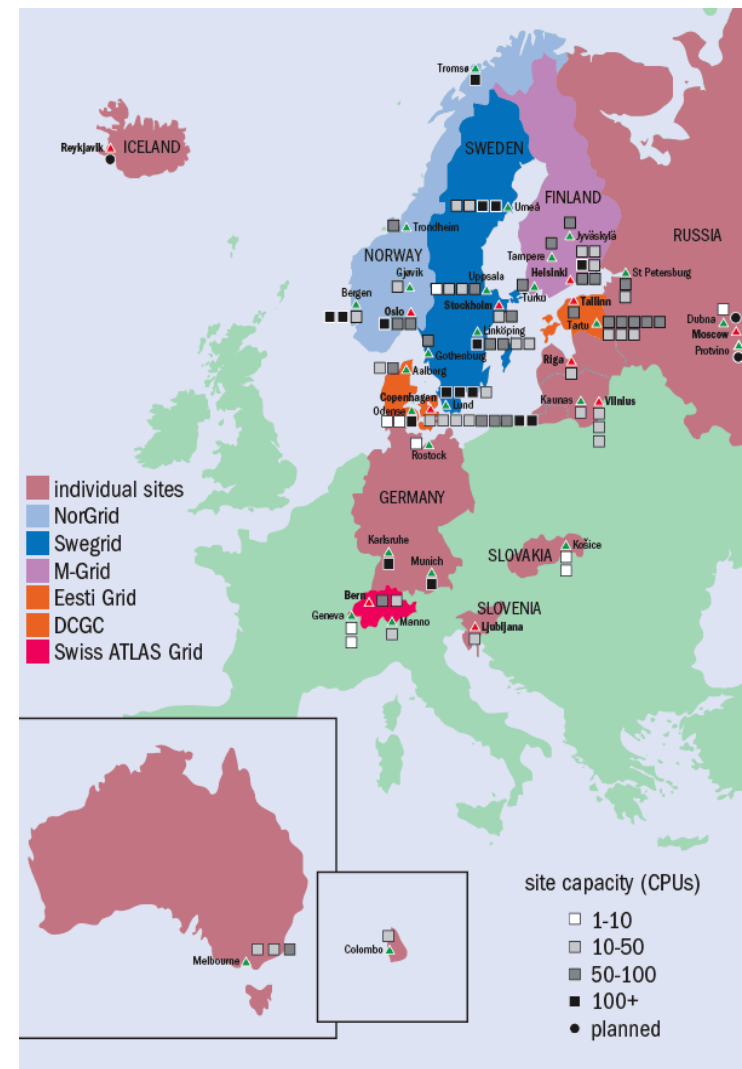
- Resources are all shared
  - Between different projects
  - Between grid and local users
  - Overall grid will hence be heterogeneous !
- SLAs between NDGF and national e-I entities
- Additional SLAs pr user group for special requirements
- Interoperability with other Grids – hopefully through standards

# Education e-Infrastructure Challenges

- Mainly related to resource access
  - Common AAI
- Research can benefit from this, but standards are only slowly emerging

# Pointers

- <http://www.nordu.net>
- <http://www.nordugrid.org>
- <http://www.ndgf.org>
- <http://www.knowarc.eu>
- Latest CERN Courier



Thanks!