Panoramic view of ARC usage in Europe

European Grid Conference
Amsterdam, February 15, 2005
European roundtour

- Eesti Grid
- Finn activities
- SweGrid
- NorGrid
- DCGC
- Germany
- Switzerland
- Slovenia
- Slovakia
Present status of the Estonian Grid

Technical details:
- 122 CPUs in 9 clusters
- 3.8 TB storage
- NorduGrid ARC middleware
- GEANT connection 622Mbit/s, between the clusters 1Gbit/s

EG CA has given out 49 user certificates and 30 host/ldap certificates. EG CA is member of EUGridPMA

Technical support and coordination group: 6 persons at the different institutions

Steering committee of the EG is established at the Ministry of Education and Research of Estonia
EG: Application areas

- **Estonian CERN CMS group** at the NICPB in Tallinn
  - **CMS detector simulation** and event reconstruction for the LHC
  - **Geant4 simulations of radiation and nuclear safety**

- **Lab of Grid technology** at the Tartu Univ.
  - **DOUG**: a partial differential equations solver
  - solid state physics simulations
  - commercial applications
  - ongoing Grid lectures and seminars

- **Inst. of Theoretical chemistry** at the Tartu Univ.
  - UNICORE, OpenMolGrid

- **Lab of cluster technology** at the Tallinn Univ. of Tech.
  - Environmental science

- **Plans**: bioinformatics, medical applications, nuclear safety, astronomy
Challenges of the Estonian Grid

- Using the local electronic ID-card (SmartCard) infrastructure for the Grid
  - 700 000 valid electronic ID-cards in Estonia!
- Local experiences with E-money and rental software
- Good connections with the Nordic Grids and UNICORE
NorduGrid ARC Related Activities at CSC, the Finnish IT Center for Science

- Putting ARC middleware into production in Finland
  - Coordinator in the Material Sciences National Grid Infrastructure Initiative (M-Grid)
- Dissemination and training in Finland
- Nordic Data Grid Facility (NDGF)
  - 1 FTE funded by the Finnish Academy, hosted by CSC
  - Working particularly on the NorduGrid Runtime Environments
- Contact people:
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  - Juha Lento <juha.lento@csc.fi>
Material Sciences Grid (M-grid) Overview

- First large initiative to put **Grid middleware into production use in Finland**: http://www.csc.fi/proj/mgrid/

- Based on **ARC and Linux clusters**, currently 443 CPUs, targeted for serial and "pleasantly parallel" applications, clusters can be accessed both locally and via ARC

- Joint project between seven Finnish universities, Helsinki Institute of Physics and CSC founded by the universities and the Academy of Sciences

- Users mainly from the **physics and chemistry** departments in the partner universities
  - Material physicists, particle physicists, chemists, some bioscientists
  - Typical applications: **Gromacs, Gaussian, Dalton**
ARC activities at HIP

- **Finnish GIIS and Computing Resources**
  - A Top-Level GIIS Maintained by HIP since September 2002
  - ARC installed on computing resources in Otaniemi and Kumpula

- **GridBlocks Portal**
  - Web based interface to grid middlewares (ARC and generic globus)
  - Allows to send grid jobs, monitor them and retrieve results, further application specific development

- **GridBlocks Agent**
  - Distributed Java agent framework, Users can control agents using standalone Java GUI, mobile phone, or PDA
  - Example implementation uses NG-Java API (previously Corba) to send NG jobs or retrieve results
  - Will be used to encapsulate multiple grid middlewares (Globus, NG, gLite) under the same interface

- **NG-Corba API**
  - NG resources accessible from any kind of client supporting Corba
  - Deprecated by NG-Java client
SweGrid

- SweGrid consists of 6 clusters located at the Swedish academic computing centres.
- The hardware is funded by a grant from the Wallenberg foundation.
- Each of the 6 clusters consists of 100 computing nodes and 2 TB disk storage.
- The sites are connected through the 10 Gb/s GigaSunet network.
- The OS installed differs between the clusters: RedHat Linux 7.3, Fedora Core 1, Debian 3.0.
- SweGrid runs on ARC.
SweGrid Users & Research

- SweGrid is designed mainly for **through-put computation**, to quickly process large numbers of loosely coupled non-parallel computations
- Users come from various fields of science: climate research, material science, physics, chemistry and biology
- The SweGrid is also used for research in various fields in IT, such as distributed data bases, brokering, etc...
- SweGrid has also developed the SweGrid Accounting System (SGAS)

http://www.swegrid.se/
Objective:

• Competence building on grid middlewares and related technologies in the Norwegian HPC environment
• Prepare a middleware infrastructure for the new HPC project NOTUR II (start 2005)

Partners: NTNU, UiB, UiO, UiT. Funding 2004: 3 FTE’s (50% NFR and 50% partners)
NORGRID activities

Used middlewares: ARC/NorduGrid and UNICORE
- ARC up and running at UiB, UiT, UiO, NTNU
- UNICORE up and running at UiB, UiT, NTNU
- Target user groups: chemistry, bio-informatics, physics
- Nordic collaboration (SweGrid, NDGF)

Alternatives: Globus and EGEE/gLite
- comparison/reference material; obtain broad experience
- Globus: await stable release of GT4.x
- monitor developments in EGEE/gLite

Related technologies
- Storage Resource Broker
- Silver Metascheduler
NORGRID interfaces

Application portals
- End-user interfaces to simplify the use of important applications on the (Norwegian) grid.

FEIDE/middleware interface
- Study and implement interface between Norwegian standard for authentication (FEIDE) and middleware authentication
- Felles Elektronisk IDEntifikasjon in Norwegian educational sector.
FEIDE has focus on standardization of user data, authentication, authorization, and access control (esp. for web applications)
Danish Center for Grid Computing run a Special Event Track on Monday:

**Nordic Data Grid Facility** pilot project was launched in spring 2003

- Initial success of NorduGrid provided grounds for a Nordic Grid facility
- [http://www.ndgf.org](http://www.ndgf.org)
- Funds for 1 director + 4 postdocs in each country
- Strong emphasis towards portal development and storage facilities
- **Aimed to evaluate various Grid solutions, uses ARC**

**Will produce recommendations for the Nordic Grid facility**

- Aims to harness all the resources in the Nordic countries
- **Grid of Grids** with a large centralized storage facility
- This facility is expected to become the Nordic Tier1 candidate
Germany

Most HEP related Grid-activities towards LCG/EGEE
- LCG installation requirements enforce dedicated centers

NorduGrid/ARC is attractive and complementary alternative at existing centers
- Pilot project at Leibniz Center Munich (LRZ) since spring 2004
- 250 P3/4 CPUs, Suse Linux, SGE batch, heavily used by many university groups
- Smooth integration of ARC in existing setup, successful participation at ATLAS DC2 production
- Test installation at GridKa (Common German LHC Tier-1 site)
  - Smooth co-existence with existing LCG-2 setup
- Further installation at Max-Planck center (RZG) under consideration
NorduGrid in Switzerland

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Nordugrid/ARC in Switzerland

**Starting Point**

- The ATLAS group at the Laboratory for High Energy Physics at the university of Bern wanted to **participate** in ATLAS DataChallenge 2 with a small prototype cluster of 4 nodes (8 CPUs and 0.5 TB Storage).
- Therefore the cluster needed to be integrated in one of the three Grids supported by the ATLAS production system: LCG, ARC, Grid3
- **The natural choice was NorduGrid/ARC, because it is light weight and designed to be plugged on already existing clusters**

**First Steps**

- The cluster was integrated in the NorduGrid ARC in July 2004 and is available for ATLAS DC2 production since. It grew to 10 CPUs and 2 TB in the meantime.
- The ATLAS group at the university of Geneva added a prototype cluster to the NorduGrid ARC in August (4 CPUs and 0.3 TB)
Plans for Switzerland

- Build a **Swiss ATLAS Grid** connecting **four clusters with the NorduGrid ARC** in February/March 2005:
  - PHOENIX at CSCS in Manno, the future Swiss TIER-2 (20 CPUs to be extended to 40). ARC will co-exist with LCG on this cluster.
  - UBELIX, the University of Bern Linux Cluster (~100 CPUs), a common HPC cluster used by scientists of different departments (astronomy, chemistry, physics, ...)
  - The two prototype clusters in Bern and Geneva, which are already integrated in the NorduGrid ARC

The Swiss ATLAS Grid will make available the CPU and storage of these clusters in a transparent way via the common NorduGrid user interface.

The activity is motivated by the **good experience with ARC**.

- Hope to get the Swiss CMS and LHCb groups on board to build a Swiss LHC Grid later in 2005.
Slovenia: SiGNET Cluster

Jozef Stefan Institute, Ljubljana, Slovenia

Andrej Filipcic, Matevz Tadel, Borut Kersevan, Jan Jona Javorsek

Running Nordugrid/ARC and participating in the Atlas-DC2 since June 2004
Signet cluster setup

- 1 dual opteron 246 server
  - nordugrid controller
  - OpenPBS/AFS server
  - gateway for nodes
  - 2TB disk space
- 21 dual opteron 240 nodes
  - 2GB memory
  - on local subnet
  - equivalent of 2.4GHz Xeon in 32-bit mode (DC2 jobs)
- RS32000 giga switch, 1.2G to GEANT
- **SuSE 9.0 64-bit system**
- In installation:
  - Secondary server, 5.5TB disk space + 22-tape LTO2 library
Signet feature: Chrooted Architecture

- Several OS images:
  - RH 7.3 (i386), SLC 3.0.3 (i386,x86_64) on server
  - NFS-exported to nodes
  - bootstrap done with direct rpm extraction, then apt-get within chroot shell (similar to gentoo instal), could be done for any linux distribution

- chroot shell
  - /usr/uchroot/uchroot.rh73, /usr/uchroot/uchroot.slc386 specified as PBS execution shell
  - chroot script automatically (bind) mounts /tmp,/afs,/proc, /dev ... to local chroot tree on nodes, enables usage of local disk space (fstab.uchroot description of mount points).
  - settings in config file (image mount dir, image-source server...)
  - modified submit-pbs-job script, hardcoded shell for now
Signet setup: benefits & experiences

- A single system image for all nodes (beowulf like)
- Fast system-image on-the-fly installation (slc303 installation took 1 hour on server and it was immediately available to nodes)
- Several images can be used at once on the same machine
- Grid execution environment can be completely separated from local system
- VO-provided images can be used -> no troubles with OS versions.
- Chroot image could eventually be distributed within grid infrastructure, together with runtime environment -> simplifies local administration
- The cluster runs very smoothly within Nordugrid, with no chroot-related troubles
Slovak Grid activities

J. Cernak and A. Dirner

Institute of Physics
Faculty of Sciences
University of P. J. Safarik
Kosice, Slovakia

Bratislava:
Institute of Informatics
Slovak Academy of Sciences
(II SAV Bratislava)

Projects: Crossgrid, EGEE,...

Kosice:
-Technical University in Kosice (TU Kosice)
-Center for Information technologies
(TU Kosice and II SAV Bratislava)
-University of P. J. Safarik in Kosice

Projects: CassoGrid,...
Slovak national university grid project

Slovakia has no national grid project!

From the year 2003 up today a discussion took place about a national grid project without a relevant conclusion.

In the beginning of this year (January 2005) we proposed to build the national university grid project which will based on ARC-middleware of the NorduGrid.

Why NorduGrid/ARC?

ARC is:
- open
- robust
- reliable
- innovative
- joining of students to work is very easy
- good practical experiences
Slovakia: Applications

- The application was solved in the **Condor PC farm** (own program and a file of parameters) couple years ago J. Cernak, Phys. Rev. E **65**, 046141 (2002).

- **Porting to ARC was very easy**. We created only one simple xRLS script! **This script replaced the file of parameters** necessary to start parametric task in the Condor pool. **The C-code remained unchanged.**

- We assume that implementation of parametric tasks running in Condor could be done automatically using a simple grammar.

Self organized criticality (SOC)
- avalanche dynamics, application at earthquakes,....
Thank for our guides

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