

M-grid Experiences Using ARC

Arto Teräs <arto.teras@csc.fi>
Nordic Grid Neighbourhood Workshop
Uppsala, Sweden, January 19, 2006



Contents

- **Introduction to the Finnish Material Sciences Grid (M-grid)**
- **ARC installation challenges**
- **Resource sharing policy in M-grid**
- **Grid experiences**
- **Plans how to serve users better**
- **Security challenges**



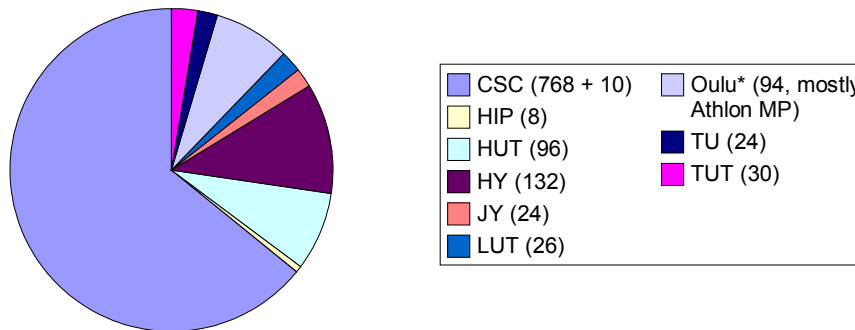
The Material Sciences Grid (M-grid)

- **Goal: Throughput computing capacity mainly for the needs of physics and chemistry researchers**
- **Joint project between seven Finnish universities, Helsinki Institute of Physics and CSC**
 - Partners mainly laboratories and departments, not university IT centers
- **Jointly funded by the Academy of Finland and the participating universities**
 - Funding application Nov 2003, deployment Oct 2004
- **First large initiative to put Grid middleware into production use in Finland**
- **Platform: Linux based PC clusters**



Hardware and CPU Distribution

- **Ten clusters of varying size**
 - Dual AMD Opteron computing nodes (HP DL145): 1.8-2.2 GHz, 2-8 GB RAM, 80-320 GB local disk
 - Front end (HP DL585): 1-2 TB shared disk
 - Network 2 x Gbit Ethernet + remote administration network
- **Total 778 (CSC) + 434 (universities) CPUs in the computing nodes, theoretical total computing power 5 TFlop/s.**



Operating System and Grid Middleware

- **NPACI Rocks Cluster Distribution**

- Cluster oriented Linux distribution, main developer San Diego Supercomputing Center, U.S.A.
- Based on Red Hat Enterprise Linux, but not a Red Hat product
- <http://www.rocksclusters.org>



- **N1 Grid Engine batch queue system**

- Local resource management in each cluster

- **NorduGrid ARC Grid middleware**

- Enables shared use of the systems, the middleware selects a free resource automatically
- <http://www.nordugrid.org>



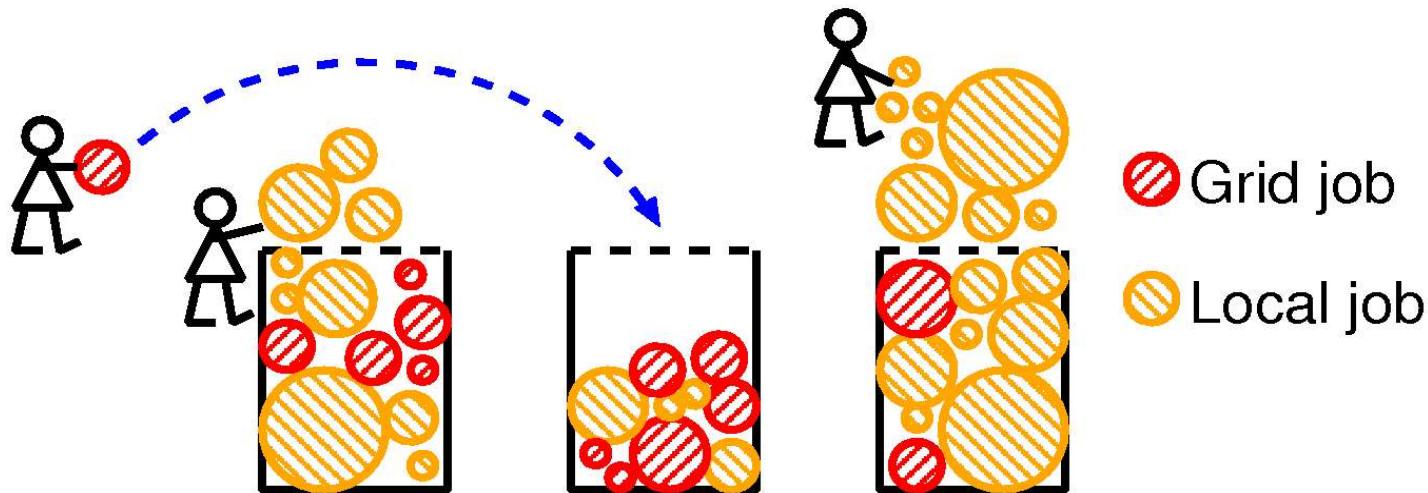
System Administration in M-grid

- **Tasks divided between CSC and site administrators**
- **CSC administrators:**
 - Maintain (remotely) the operating system, batch queue system, Grid middleware and certain libraries for all sites except Oulu
 - Separate small test cluster for testing new software releases
- **Site administrators**
 - Local applications and libraries, system monitoring, user support
- **Regular meetings of administrators every two months, common mailing list**



Grid Use and Resource Sharing

- **Policy: Jobs can be submitted both to the local queue and through the grid interface**
 - Priority: local jobs 80%, grid jobs 20%
- **Goal is to minimize waste of resources: empty nodes are always available for use (dynamical sharing)**



Installation Timeline

- **Nov 2004:** Systems installed and ready for local use
- **Aug 2005:** ARC installation, initial successful tests
- **Sep 2005:** ARC tutorial at CSC
- **Nov 2005:** New cluster sepeli connected, access opened to all CSC customers, improved ARC support for the local batch queue system
- **Plans for 1H/2006:** A second tutorial, configuring MPI environments for ARC, adding runtime environments, improving operational practises



Challenges Installing ARC

- **64 bit environment**
 - ARC was based on Globus 2.4 which didn't support a 64 bit environment
 - Installed using the Globus 4.0 source distribution and ARC source rpms
- **N1 Grid Engine**
 - ARC support for the N1 Grid Engine (previously Sun Grid Engine) batch queueing system was buggy
 - Fixing bugs and adding a few improvements before deployment took time
- **Development version of ARC required**



Grid Experiences

- **Currently few Grid users**
 - Most users are still happily submitting jobs directly to the local batch queue
- **Grid environment must be better than the existing one, otherwise nobody will use it!**
 - The environment is still in development: MPI environments and other runtime environments need to be added
 - Long queue in the local cluster and empty resources on the Grid may be a good enough incentive
- **Collaboration model in system administration has been successful: Grid projects always have other aspects than just the technology**



Obstacles to Grid Adoption

- **Need to request a certificate**
 - Not a very big problem: we have many more certificates requested than actual active users
- **Different job description syntax compared to the local batch queue system**
- **Need to list the input files in the job description**
 - There is no obvious way to specify a whole directory
- **Getting the groups to make their software available as runtime environments**
- **Higher failure rate and less determined execution times require job management tools**

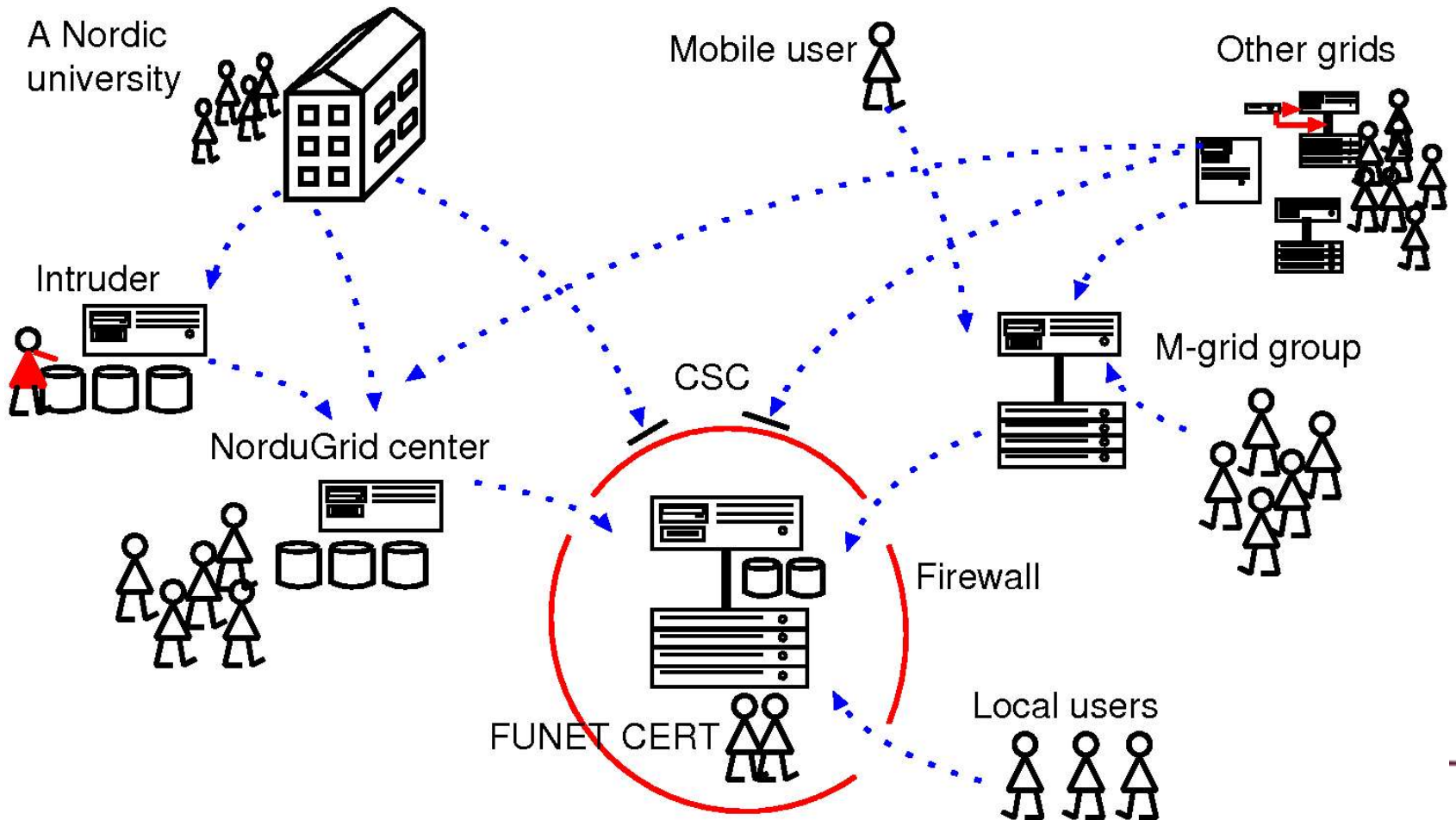


Plans to Serve Users Better

- **Concentrate first on a few selected popular applications**
 - Create runtime environments with detailed usage instructions and examples
 - Validate with real world test cases including parallel MPI runs
- **More tutorials and articles**
 - Migration guide from local jobs to grid jobs
- **Provide job management tools and examples**
- **Present M-grid more clearly on CSC web pages as one of the available computing platforms**
- **Improve system level monitoring to detect failures**



Grid Collaboration and Security



CSC

Security Challenges in the Grid

- **Grid goes beyond organizational borders**
=> Mutual trust is a key requirement!
- **Potential to do widespread damage with a compromised account**
=> Need to consider operational security when opening access to large user groups
- **Getting all the relevant parties involved**
 - Computing centers, university IT departments, local admins, CERTs and also users
 - International collaboration
- **Data protection and privacy**



More information

- **M-grid homepage:** <http://www.csc.fi/proj/mgrid/>
- **NorduGrid homepage:** <http://www.nordugrid.org>
- **Contact people:**
 - Arto Teräs <arto.teras@csc.fi>
 - Kai Nordlund <kai.nordlund@helsinki.fi>
 - Olli-Pekka Lehto <oplehto@csc.fi> (Rocks)
 - Urpo Kaila <urpo.kaila@csc.fi> (security)
- **Thank you! Questions?**

