M-grid Experiences

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- **Summary**

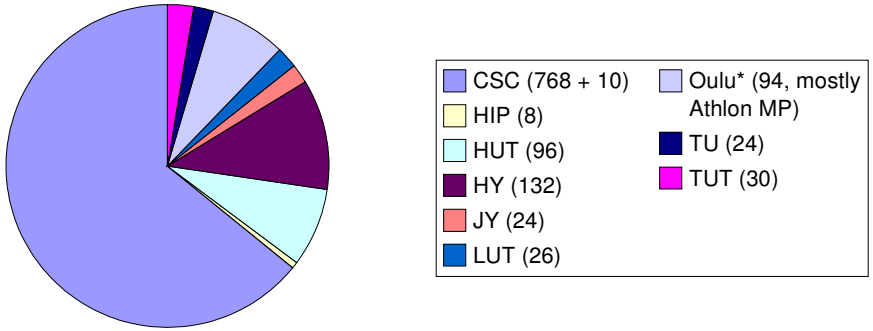
The Material Sciences Grid (M-grid)

- **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**

CSC

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

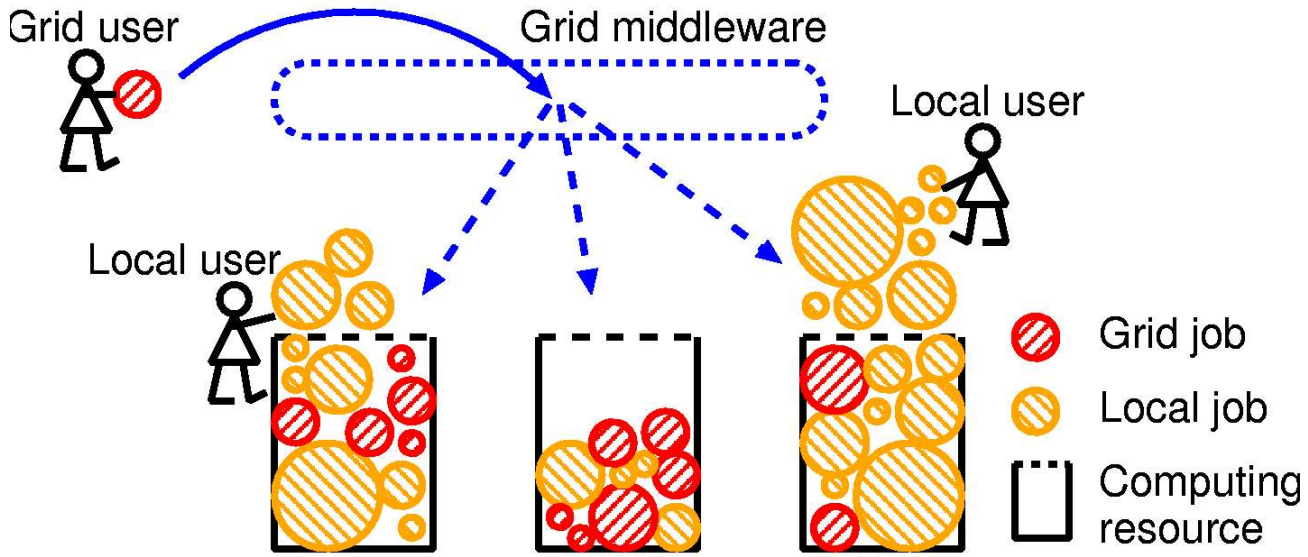
- **NorduGrid ARC Grid middleware**
  - Enables shared use of the systems, the middleware selects a free resource automatically
  - http://www.nordugrid.org

System Administration in M-grid

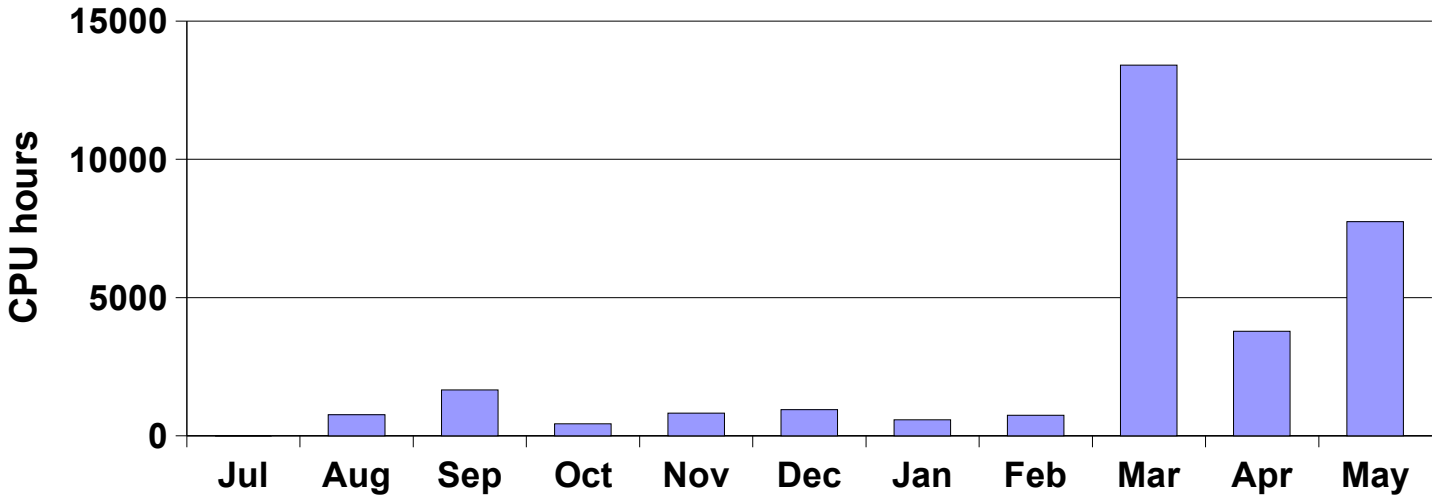
- **Tasks divided between CSC and site administrators**
- **CSC administrators:**
  - Maintain (remotely) the operating system, batch queue system, Grid middleware and certain libraries for all sites except Oulu
  - Separate small test cluster for testing new software releases
- **Site administrators**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

Resource Sharing

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



Grid Use July 2005 - May 2006



- **Total 31 000 CPU hours of jobs submitted through the Grid interface: only 1.5% of the total use of the clusters**
- **Latest months show a clear increase in Grid use**

Grid Experiences

- **Currently a handful of active Grid users**
  - About one out of five users has continued after initial tests
  - 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!**
  - Users should not need to put extra effort on adapting their applications to the grid
  - Long queue in the local cluster and empty resources on the Grid is a good enough incentive to some users
- **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**
- **Higher failure rate and less determined execution times require job management tools**
  - Most of our active users are competent in scripting and have developed their own job management
- **File management: shared disk is only visible within the local cluster**
- **Too few applications adapted for the Grid (Runtime Environments)**

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**

Summary

- **The M-grid systems are in heavy use locally, most users are satisfied**
- **Collaboration model in system administration has been successful**
- **Only a handful of active Grid users, but they have been able to take advantage of otherwise unused capacity**
- **M-grid experiences will be used when planning new Grid deployments in Finland**

More Information

- **M-grid homepage: http://www.csc.fi/proj/mgrid/**
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- **Thank you! Questions?**