POZNAŃ SUPERCOMPUTING AND NETWORKING CENTER

QosCosGrid

QosCosGrid Middleware

Tools and Services for Advanced Job Management, Advance Reservation and Co-allocation of Computing Resources

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EGI Technical Forum – Madrit 2013

QosCosGrid

Outline

- QCG general information
- QCG Architecture & Components
- Tools for end-users
- Success stories
- Integration with EGI
- Documentation & Repositories
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- Questions

QosCosGrid middleware

The QosCosGrid (QCG) middleware is an integrated system offering advanced job and resource management capabilities to deliver to end-users supercomputer-like performance and structure. By connecting many distributed computing resources together, QCG offers highly efficient mapping, execution and monitoring capabilities for variety of applications, such as parameter sweep, workflows, MPI or hybrid MPI-OpenMP.

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QCG functionality

Automatic steering of various types of complex computing experiments:

- Simple tasks
- DAG Workflows with recursive conditions and dependencies on any task status
- Multi-Dimentional parameter sweep tasks
- Single cluster Parallel tasks (MPI/OpenMP)
- Cross-Cluster Parallel tasks

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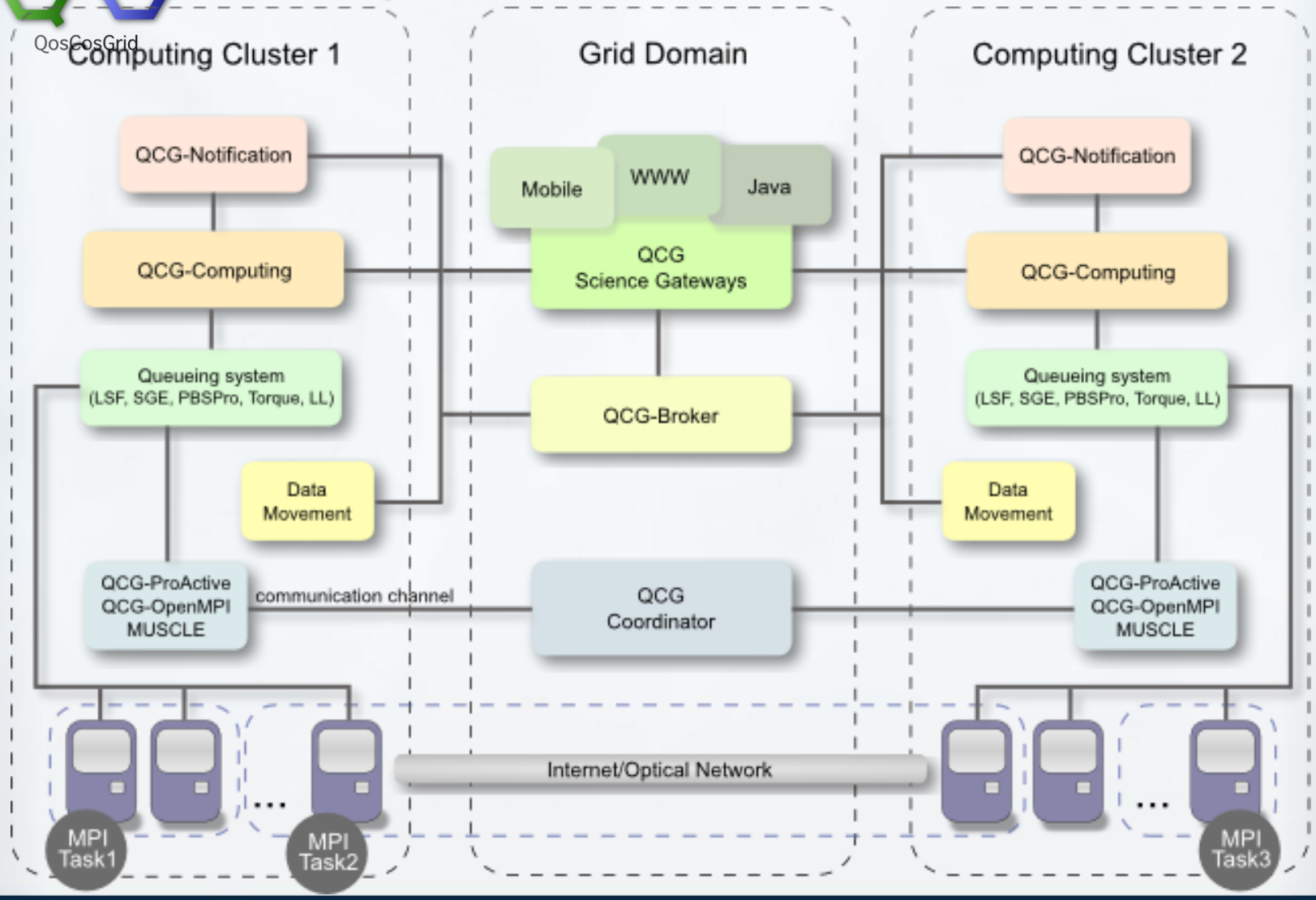
QCG Functionality

- Advance reservation capabilities
  - Quality of Service
  - Co-allocation of resources and cross-cluster
- Support for interactive tasks
- Possibility to connect to running task with interactive session
- Task status and progress notifications

QCG Architecture



QCG-Computing

- Deployed on access nodes of the batch systems (SGE, Slurm, torque/maui, LoadLeveler, PBS Pro, Condor, Apple Xgrid)
- Provides remote access to task submission and advance reservation capabilities of LRMS via DRMAA interface
- Compatible with the OGF HPC Basic Profile specification (JSDL and BES)
- Offers basic file transfer mechanisms

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QCG-Notification

- Supports the topic-based publish/subscribe pattern for asynchronous message exchange
- Serves as the main message bus between the services, applications and the end-user
- Is capable of sending notifications using variety of transport mechanism, including SOAP, SMTP and, what is a unique feature, the XMPP protocol

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QCG-Broker

- Offers scheduling and brokering of jobs capabilities
- Controls the whole experiments execution (including workflows and parameter sweep tasks)
- Provides requested QoS and co-allocates resources
- Stages in/out files and directories

QCG Tools & Clients

- QCG-SimpleClient (command line)
- QCG-Icon (GUI)
- QCG-Science-Gateways (web)
- QCG-QoS-Access (web)
- QCG-Monitoring (web)

- QCG-Data (clone of iDrop, under development)
- QCG-Icon2 (under development)

QCG–SimpleClient

- Set of commands patterned on queuing system tools
- JSDL, QCG-Simple, QCG-XML description dialects
- Support for interactive tasks
- Automatic staging in/out files
- Notifications about statuses and progress of application (mail, xmpp, QCG-Monitor)

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QCG-SimpleClient

Submission and controlling of tasks:

- **qcg-cancel** - cancel task(s)
- **qcg-clean** - clean the working directories of given tasks
- **qcg-connect** – establish interactive session to the task
- **qcg-info** - display detailed information about the given tasks
- **qcg-list** - list tasks in the system
- **qcg-peek** - display ending of (stdout, stderr) streams
- **qcg-proxy** - create user proxy certificate
- **qcg-refetch** - retry/repeat the transfer of output files/directories
- **qcg-refresh_proxy** - refresh user proxy certificate for given tasks
- **qcg-sub** - submit batch or interactive tasks to be processes by QCG

Resources reservation and control:

- **qcg-rcancel** - cancel reservation(s)
- **qcg-reserve** - reserve resources
- **qcg-rinfo** - display information about the given reservation(s)
- **qcg-rlist** - list reservation in the system

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qcg-offer command

```
[plgpiontek@qcg ~]$ qcg-offer

HYDRA:
Summary:
    Metric Name          nodes/cores      share
     Total Resources:     282/5340     100%/100%
        Up Resources:     250/4668      88%/87%
      Used Resources:     114/1710      40%/32%
      Free Resources:     129/2628      45%/49%  (FreeNodes=87x12,17x16,18x48,7x64)
  PartFree Resources:     142/2810      50%/52%  (AvgFreeCoresPerNode=19)
  Reserved Resources:       2/24         0%/00%  (Utilization=0%)

GALERA:
Summary:
    Metric Name          nodes/cores      share
     Total Resources:     195/2700     100%/100%
        Up Resources:     191/2652      97%/98%
      Used Resources:     139/1426      71%/52%
      Free Resources:      38/456       19%/16%  (FreeNodes=38x12)
  PartFree Resources:      73/698       37%/25%  (AvgFreeCoresPerNode=9)
  Reserved Resources:       9/468        4%/17%  (Utilization=0%)
```

QCG-Simple Description

```
#QCG note=NAMD apoa1
#QCG host=hydra.icm.edu.pl
#QCG walltime=PT10M
#QCG queue=plgrid
#QCG nodes=1:12:12
#QCG output=apoa1.output
#QCG error=apoa1.error
#QCG application=NAMD
#QCG argument=apoa1/apoa1.namd
#QCG stage-in-file=apoa1.zip
#QCG preprocess=unzip apoa1.zip
#QCG stage-out-dir=. -> results
#QCG notify=xmpp:tomasz.piontek@plgrid.pl
#QCG watch-output=mailto:tp@mail,20,ENERGY
```

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XMPP Status Notification

qcg-notification@plgrid.pl

Rozmowa Opcje Wyślij do

qcg-notification@plgrid.pl
Nie upoważniono

(21:27:14) **qcg-notification@plgrid.pl:**
QCG-Broker Event Message
Job ID: J1378927597488__6054
Task ID: task
- Timestamp: 2013-09-11T21:27:14.391+02:00
- Status: RUNNING

Namespace: http://schemas.qoscosgrid.org/broker/2012/01/notification-topics
Topic: QCGBroker/Job/Task

(21:27:19) **qcg-notification@plgrid.pl:**
QCG-Broker Event Message
Job ID: J1378927597488__6054
Task ID: task
- Timestamp: 2013-09-11T21:27:19.175+02:00
- Status: FINISHED

Namespace: http://schemas.qoscosgrid.org/broker/2012/01/notification-topics
Topic: QCGBroker/Job/Task

Czcionka Wstaw Uśmiech! Uwaga!

QCG-Icon

- lightweight intuitive application for Windows, MAC OSX and Linux platforms,
- provides transparent, unified access to applications installed on Grid resources and available via QosCosGrid services.
- automatically transferes input / output files between Grid and user-side.
- gives to the user impression of local work

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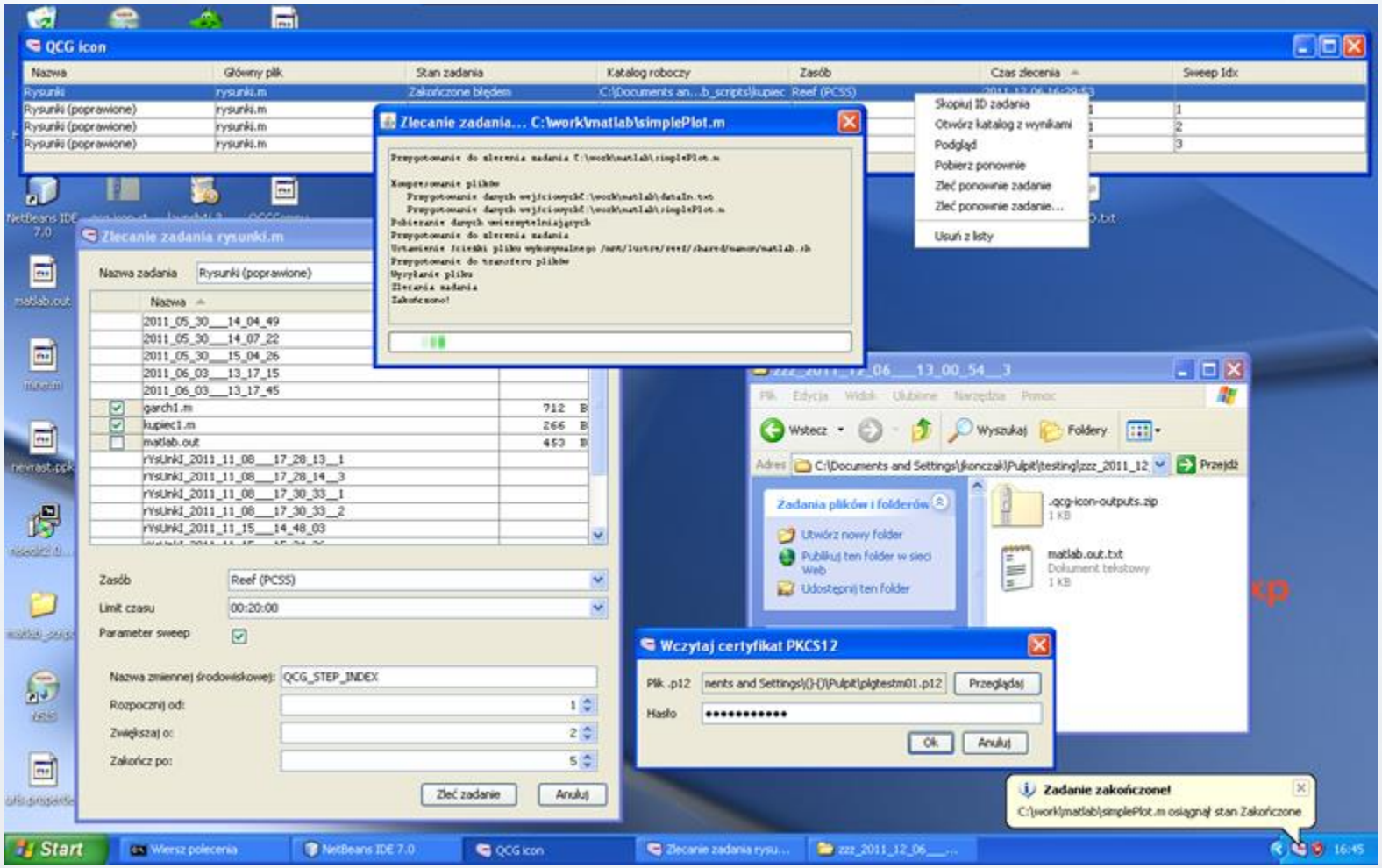
QCG-Icon



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QCG Science Gateways

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QCG-Monitoring

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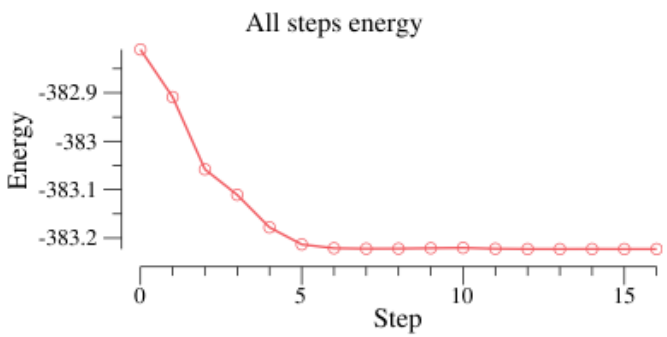
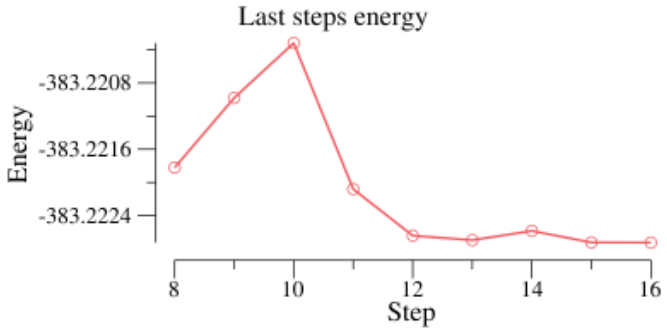
QCG gaussian job J1368793153691__7065 data





Step	Energy	Difference
0	-382.810458	
1	-382.908823	-0.098365
2	-383.058101	-0.149278
3	-383.110761	-0.052660
4	-383.177936	-0.067175
5	-383.213193	-0.035257
6	-383.221050	-0.007857
7	-383.221981	-0.000932
8	-383.221821	0.000160
9	-383.220981	0.000840
10	-383.220320	0.000661
11	-383.222080	-0.001760
12	-383.222641	-0.000561
13	-383.222695	-0.000054
14	-383.222584	0.000112
15	-383.222723	-0.000140
16	-383.222725	-0.000002

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QCG-QoS-Access

QosCosGrid Tools & Services

QCG-Access | QCG-Monitoring | Configuration

Count of Reservations on the screen: 5 Reservation range: 0 - 5 Refresh Create Reservation

Reservation ID	Start time	End time	Resource	Status
R1368515738190_RESERVATION_9226	Tue May 14 11:20:00 GMT+0200 2013	Tue May 14 11:22:00 GMT+0200 2013	6	FINISHED
R1368453492238_RESERVAT				FINISHED
R1368452105122_RESERVAT				FINISHED
R1368451751472_RESERVAT				FAILED
R1368451596571_RESERVAT				FAILED

Cancel Selected Reservation

Reservation information:

ID: R1368515738
Start time: Tue May 14 11:
End time: Tue May 14 11:
Status: FINISHED
Slots: 6
Resources:
Host: grass1-dev.ma
Slots: 6
Local ID: R2466
Nodes: 1
Node: grass1 Slots: 6

Create Reservation

Time Window:

Start: 16 : 24 05/15/2013

End: 16 : 24 05/16/2013

Reservation Duration:

Hours: 1 Minutes: 00

Resources:

Cluster:

Reserve Slots: 1

Reserve Nodes: 1 Slots per Node: 1

Create Reservation Close

Reservation information:

QCG Success Stories

- Infrastructural and research EU and national projects

  (PLGridPLUS, pMedicine, AirPROM, MAPPER, ACGT, BEinGRID, PL-GRID, QosCosGrid, BREIN)
- Production deployment on PL-Grid resources (the most popular middleware in Poland)
- EGI & PSNC/QCG MoU (2012)
- BCC-UNG&PSNC/QCG MoU (2013)
- Part of UMD 3.2.0
- Cooperation with PRACE

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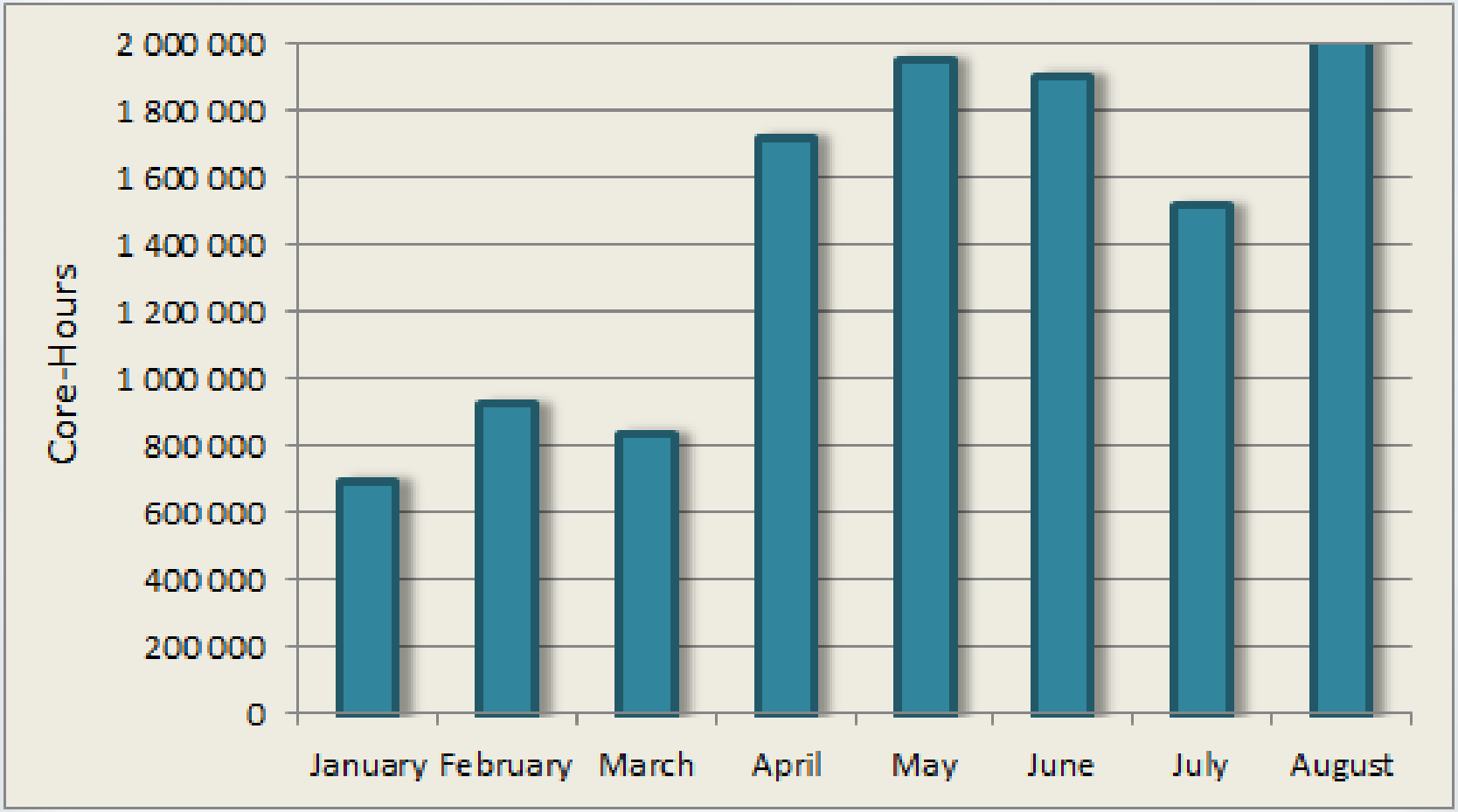
PLGrid Statistics (2013)



QCG – integration with EGI

- QCG unit support in GGUS
- SAM Nagios probes & Dashboard alerts
- APEL / GRID-SAFE accounting
- Advertising GLUE2 schema information in BDII (in progress)
- Integration with Virtual Organization Management Support (VOMS)

- Part of the UMD 3.2.0 (September 2013)
- QCG-Icon in AppDB

QCG Deployment

- Installation from packages
  - QCG software repository
    - For SL5/SL6 and Debian (QCG-Comp, QCG-Notif)
  - UMD repository
    - SL5 (SL6 in next update with SHA2 support)
- Installation from sources
- Windows/Linux/MacOS QCG-Icon installer

QosCosGrid

www.qoscosgrid.org

QosCosGrid
Distributed Computing Infrastructure - Middleware & Tools

Login Preferenc

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QosCosGrid

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QCG Middleware

QosCosGrid provides:

- the most efficient remote access to computational resources in a single cluster or many clusters in Poland and Europe,
- automatic steering of various types of complex computing experiments ranging from multi-parameter sweep studies to cross-cluster executions of parallel applications,
- fully transparent integration with parallel programming and execution environments like OpenMPI and ProActive

News

QosCosGrid 3.0 *[16 July*
A new major release of
been just published!
includes many improve
the access to application
overhead needed to run
a grid environment. Unc
applied mechanisms, e.
of QCG-Client comman
transfer rate or adv
capabilities, will all
concentrate even more
scientific work.

QCG-Icon 1.4.3 *[21 June*
Next version of QCG-I
download. Since the ve
many improvements

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Contact

General questions:

contact@qoscosgrid.org

Technical questions:
support@lists.qoscosgrid.org

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Questions ?
Comments !
Advices ;-)