# Global Grid Monitoring: The EGEE/WLCG Case

A. Duarte, P. Nyczyk, A. Retico, D. Vicinanza

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**www.eu-egee.org**

Information Society and Media

- **gLite overview**
- **SAM (Service Availability Monitoring)**
- **Other monitoring tools**
- **Conclusions**

Enabling Grids for E-sciencE

- **80 developers (12 research centers)**
- **gLite 1.0: initial version, released in April 2005**
- **gLite 1.5: latest LCG-independent version, released in Jan. 2006**
- **gLite 3.0: merging LCG 2.7 and gLite 1.5, May 2006**
- **since 3.0 no separate releases of LCG and gLite middleware**

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- **gLite services groups:**
  - Access and Security Services
  - Information and Monitoring Services
  - Data Services
  - Job Management Services

Enabling Grids for E-sciencE

- **gLite services scopes:**
  - User
  - Site
  - Virtual Organization (VO):
    - Biomedical
    - High Energy Physics
    - etc...
  - and global (i.e.multi-VO)
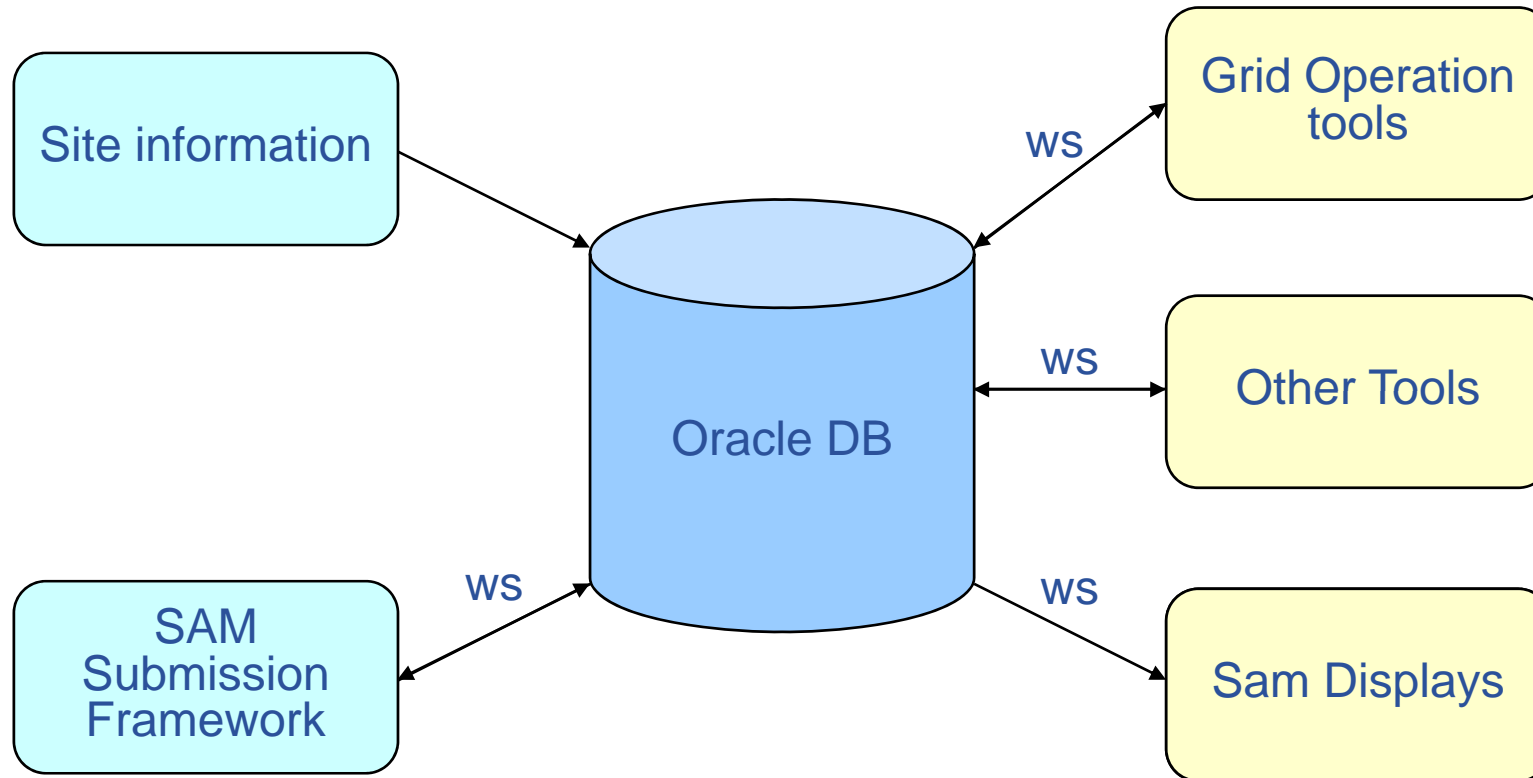
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- **Access and Security Services**
  - Identifies users, allowing or denying access to services, on the basis of some agreed policies.
  - provides credentials using Public Key Infrastructure (PKI) X.509
    - Certification Authorities as trusted third parties.

- **Information Service (IS) and Monitoring:**
  - Provides information about the gLite resources and their status.
    - used to locate resources
    - and for monitoring and accounting purposes.
  - Data published to the IS conforms to a schema

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- **Job Management System**
  - Computing Element (CE) service
    - computing resources localized at a site (clusters with Worker Nodes)
  - Workload Management System (WMS) - (global)
    - matching jobs to CEs according to job requirements and optimization
    - managing full life-cycle of the job across sites.

- **Data Management System**
  - **storage back-end (site)**
  - **stored files registered in a central catalogue (LFC) (global)**

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- **Monitoring  EGEE/WLCG grid infrastructure**

- **Service level monitoring**
  - Service availability (and functionality) checked by launching tests on the monitored sites

- **In production since one year**

- **Managing a growing infrastructure**
  - 20 sites -->  60 sites --> 200 sites (in four years)

- **Main source of information for Grid Operations**

- **Basis for Availability**

- Framework structure
  - **SAM submission framework**
  - **Oracle DB**
  - **Web Services**
  - **Visualization part (SAM displays)**

Site information

Grid Operation tools

ws

Oracle DB

ws

Other Tools

SAM Submission Framework

ws

ws

Sam Displays

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- **Input**
  - Site information collection tools
    - Static and dynamic information
  - SAM submission framework
    - **test submission**
    - **high level execution workflow**
- **Storage and Processing**
  - Web services
    - **query/publishing**
    - **programmatic interface**
      - *tool for other services*
  - **Oracle Database**
    - **Storing the test results, test description, test criticality, alarms, etc...**

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- **Output**
  - SAM display
    - SAM portal (to be faced out in ~1 month)
    - GridView
      - *availability graphs*
      - *historical test results*
      - *detailed test results*

- **Service Availability is computed**
  - Per Service Instance
  - Per Service Type (eg. CE) for a site
  - Per Site
  - Over various periodicities like Hourly, Daily, Weekly and Monthly

- EGEE/WLCG infrastructure;
  - **~200 sites**
  - **11 federations or regions**
- ROC:
  - **responsibility for the services within its region**
  - **conformity to a set of agreed operation procedures.**
- Grid Operators (COD):
  - **monitoring the availability and performance of the grid services.**

**Enabling Grids for E-sciencE**

- COD is Operator on Duty

- **global WLCG/EGEE GRID monitoring**

- **SAM tests raise alarms about site failures which are reported to COD**

- **Then COD:**
  - **detect issues affecting the grid services**
  - **provides a first analysis**
  - **reports existing problems to the relevant ROCs**
  - **validates the solution provided**

- **1 (2) ROCs responsible for the whole GRID operations at a time**
  - 11 ROCs involved
  - weekly rotation

Regional Operations Centre ●
GGUS ○
Operations Coordination Centre ☐
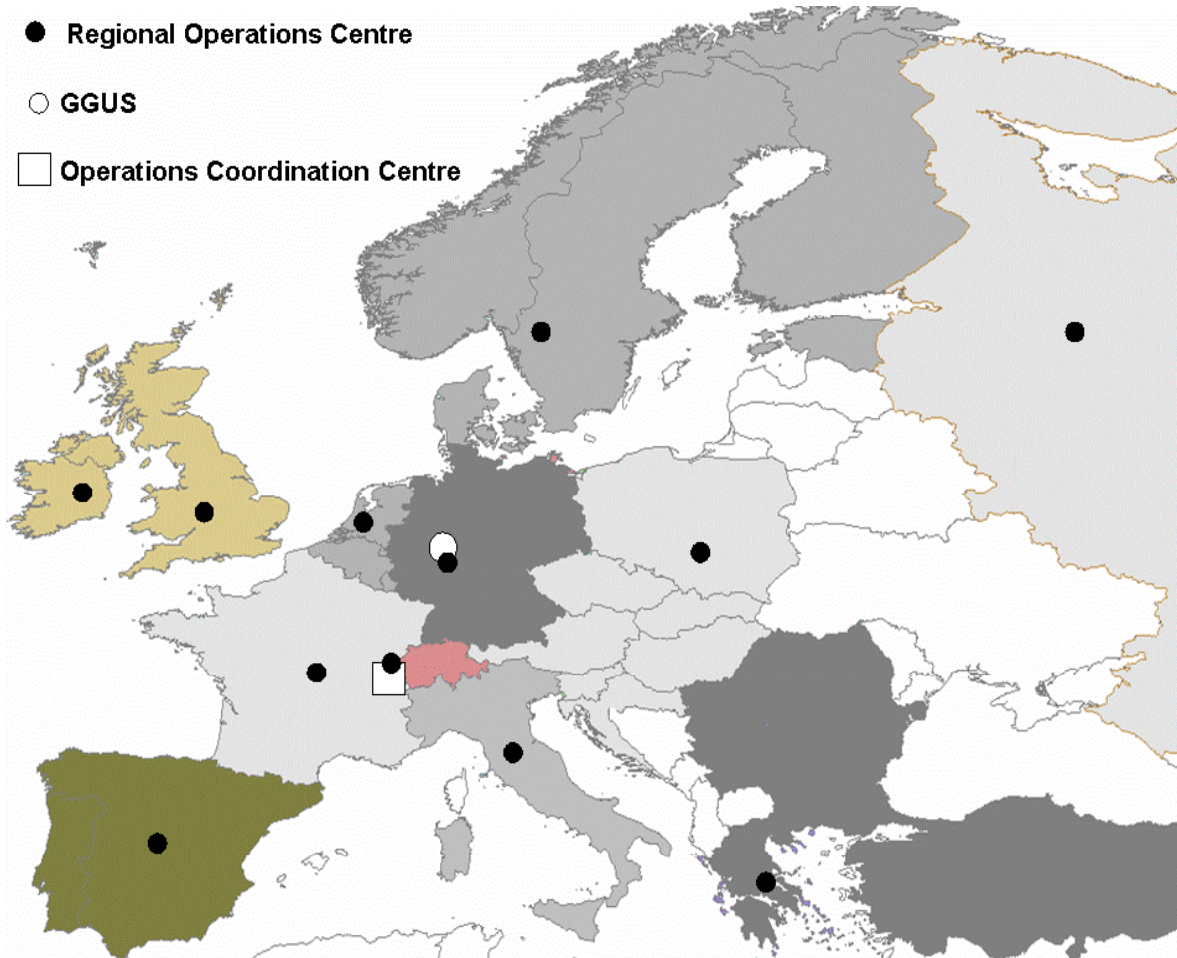


- **Regional Operations Centres (ROC)**
  - One in each region (incl. Asia-Pacific)
  - Front-line support for user and operations issues
    - point of contact for sites in the region
  - Provide local knowledge and adaptations
  - Manage daily Grid operations – oversight, troubleshooting
  - Run infrastructure services

- **for Asia-Pacific region**
  - Asia-Pacific
    - roc@lists.grid.sinica.edu.tw
    - Jason Shih, Min-Hong Tsai, Shu-Ting Liao
  - CERN (catch-all ROC)
    - egee-roc-cern@cern.ch
    - Nicholas Thackray

- **Grid Operations**
- **Site Certification**
  - Technical suitability, convenient level of quality
  - SAM test results are crucial in the certification procedures of most EGEE/WLCG ROCs.
    - On demand submission (web interface, Poznan)
    - Official hourly submission (CERN)
- **Availability**
  - ROC reports
- **Site monitoring**
  - site admins, ROC, etc...

- A number of grid infrastructures are currently monitored by SAM. Major examples:
  - **EGEE/WLCG**
  - **SEE-Grid**
  - **EELA**
  - **Health-e-Child**
  - **EuMedGrid**
  - **EuChinaGrid**
  - **BalticGrid**

- SAM platforms were deployed for those projects in slightly different configurations, according to the number of sites monitored, hardware and software resources.

- **It provides:**
  - status and utilization information at site and resource level
  - basic statistics
  - real-time alerts
  - geographic map
- **Main server based on Nagios (open source, host and network service monitor)**
- **Centralized architecture**
  - a main server periodically queries a set of nodes to extract information about the status of grid and network services, and the utilization of resources.
- **Collected information is stored in a DBMS and used to build aggregate statistics and trigger alerts**

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- Information System monitoring web interface
- Analysing data published by the sites
  - **sanity of the data**
  - **reliability of the data**
  - **aggregated and detailed graphs**
  - **history plots**
- Provides information to SAM
- Gathers information the site publishes about the services running there

**gstat**

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File  Edit  View  Go  Bookmarks  Tools  Help

http://goc.grid.sinica.edu.tw/gstat/INFN-BARI/

**GStat: 11:48:17 06/14/06 GMT**

home alert table service regional service metrics links ❓ prod pps test baltic eela euchina eumed seegrid

| INFN-BARI Status: OK | | ok | GOC graphs |
|---|---|---|---|

```
GOCDB Configuration information:
status: Certified, type: Production
giis url: ldap://gridba2.ba.infn.it:2170/mds-vo-name=infn-bari,o=grid

To test site GIIS:: ldapsearch -x -H ldap://gridba2.ba.infn.it:2170 -b mds-vo-name=infn-bari,o=grid
```

| **BDII Node Check: .** | alert_history ❓ |
|---|---|

| **CERN SE Check .** | alert_history ❓ |
|---|---|

```
No BDII Node to check in GOCDB
test: ldapsearch -xLLL -l 15 -h bdiihostname -p 2170 -b 'GlueSEUniqueID=lxn1183.cern.ch,mds-vo-name=CERN-CIC,mds-vo-name=local,o=grid' '(|(GlueSEUniqueID=lxn1183.cern.ch)(objectclass=GlueSA))' GlueSEUniqueI
```

| **GIIS Perf Check: ok** | alert_history ❓ |
|---|---|

```
Query Response Time (ms):      4097.1 - OK
GIIS Entries Found:            248 - OK
GIIS Old Entries Found:        0 - OK
```



```
□ giisEntry  ■ giisOld
giisEnt max:  252.00   avg:  208.49   cur:  248.00
giisOld max:    0.00   avg:    0.00   cur:    0.00

□ giisTime
giisTim max:  15.72 k  avg:  4.08 k   cur:  4.04 k
```

| **GIIS Sanity Check: ok** | alert_history ❓ |
|---|---|

```
Passed

To test site GIIS:: ldapsearch -x -H ldap://gridba2.ba.infn.it:2170 -b mds-vo-name=infn-bari,o=grid
```

| **Service Check: ok** | alert_history ❓ |
|---|---|

| hostname | monitor | nodetypes | missing services | history |
|---|---|---|---|---|
| gridba2 | Y | CE,None | none missing | alert_history |
| gridba6 | Y | SE,None | none missing | alert_history |
| gridba6 | Y | MON,SE | none missing | alert_history |

Done

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- How EGEE/WLCG infrastructure is operated and monitored
- The main monitoring framework, Service Availability Monitoring or SAM, is being currently used to
  - **monitor some of the largest production grids available nowadays**
  - **improve the reliability of the monitored grid services**
- Discussed SAM role for
  - **Grid Operations**
  - **Site certification**
  - **Availability**
  - **Site Monitoring**
- Presented some additional monitoring tools
  - **GridICE**
  - **GStat**

**Thanks for the attention!** ☺

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$$\text{Status of node } N = \bigwedge_{t \in CriticalTests} TestResult (N,t)$$

$$\text{Status of central service } C = \bigvee_{N \in instances(C)} Status (N)$$

Status of site S = AND

| $\wedge$ = boolean AND |
| $\vee$ = boolean OR |

CE1
OR
CE2
⋮
OR
CEn

SRM 1
OR
SRM 2
⋮
OR
SRM n

site BDII
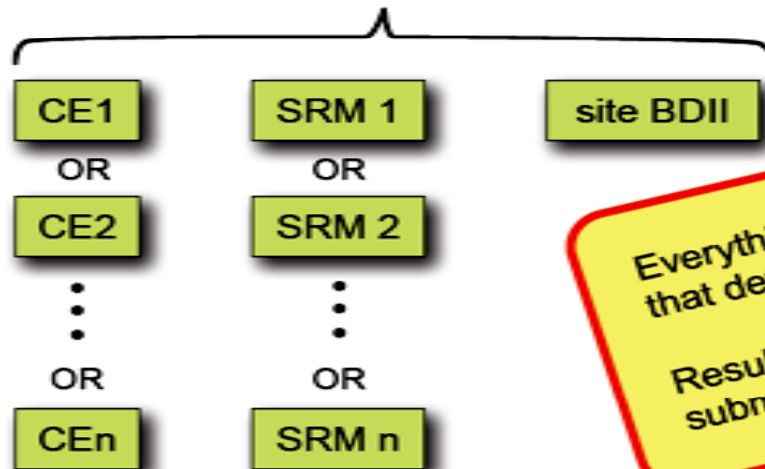
Everything is calculated for each VO that defined critical tests in FCR

Results make sense only if VO submits tests!!!