Global Grid Monitoring: The EGEE/WLCG Case

A. Duarte, P. Nyczyk, A. Retico, D. Vicinanza
CERN – IT

HPDC 2007 Workshop on Grid Monitoring, Monterey, USA, 25 June, 2007
Outline

• gLite overview
• SAM (Service Availability Monitoring)
• Other monitoring tools
• Conclusions
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
• **gLite services groups:**
  – Access and Security Services
  – Information and Monitoring Services
  – Data Services
  – Job Management Services
gLite services scopes:
- User
- Site
- Virtual Organization (VO):
  - Biomedical
  - High Energy Physics
  - etc...
- and global (i.e. multi-VO)
• **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
• **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)
• 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)
• 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...
• Output
  – SAM display
    ▪ SAM portal (to be faced out in ~1 month)
    ▪ GridView
      • availability graphs
      • historical test results
      • detailed test results
GridView visualization of SAM results

Monitoring and Visualization Tool for LCG
Data Transfer | Job Status | Service Availability

Detailed SAM Test Results

Generating JDL LHCb file:

Submitting a LHCb job
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.
• 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 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-roccern@cern.ch
  - Nicholas Thackray
Grid operations in EGEE/WLCG: the SAM role

- 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.
Other monitoring tools: GridICE

- 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.
Other monitoring tools: GStat

- 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
Conclusions

- 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! 😊
Availability metrics

Status of node \( N \) = \( \bigwedge \) \( \text{TestResult}(N,t) \) for \( t \in \text{Critical Tests} \)

Status of central service \( C \) = \( \bigvee \) \( \text{Status}(N) \) for \( N \in \text{Instances}(C) \)

Status of site \( S \) = AND

- CE1
- OR
- CE2
- OR
- \ldots
- OR
- CEn

- SRM 1
- OR
- SRM 2
- OR
- \ldots
- OR
- SRM n

Everything is calculated for each VO that defined critical tests in FCR.
Results make sense only if VO submits tests!!!