

# MJRA3.9: Set-up of accounting techniques and distributed budgets

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## MJRA3.9: Set-up of accounting techniques and distributed budgets.

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- The document gives a description of the current situation on the accounting and quota management in EGEE.
- Recommendations for the future are given.
- Accepted by the PEB on Dec 6th 2005
- <https://edms.cern.ch/file/638418/1>

## Executive Summary.

- EGEE accounting mechanisms primarily collect usage records on CPU-usage.
  - Currently operating in a pilot mode.
  - Significant work completed on accounting systems.
- The APEL system collects data from a portion of the EGEE resources.
  - Not yet integrated into the gLite release.
- DGAS has just been integrated into gLite.
  - Not yet fully deployed and online yet.
- The SGAS accounting and quota enforcement system operates on SweGrid.

## Executive Summary.

- Storage and network usage accounting.
  - Currently no Grid-specific network usage and accounting systems.
  - The concept and practice of storage accounting needs to be implemented in the Grid environment.
  - Should be integrated into these existing accounting systems.
  - EGEE gLite FTS software logs data transfers and can be a good starting point.
- In order to minimize over-use of Grid resources some form of Grid-wide quota enforcement system will have to be deployed.
- These quota enforcement systems need to be developed, integrated and deployed with gLite.
- In summary, the existing accounting systems should be used and tested.

# Background.

## A review of the different accounting and quota models for Grids.

- After-the-fact accounting.
  - Accounting system collects non-repudiable usage records (URs).
  - Coupled to pricing and billing processes to charge users for their usage.
  - Does not prevent users from over-using the resources.
  - Analogy: Credit card accounting.
- On-line (real-time) Accounting.
  - URs are sent immediately to central location.
  - Up-to-date snapshot of the user's current resource consumption.
  - Difficult in Grid environment but prevents over-use of Grid resources.
  - Analogy: pre-paid phone card accounting.

# Background.

## A review of the different accounting and quota models for Grids.

- **Quotas.**
  - There has to be some fair-share or quota system.
  - Batch systems perform this within a cluster, need VO-wide.
  - Quotas imply the concept of enforcement.
- **Allocated Quotas.**
  - The enforcement of predetermined budgets, usage is deducted from the pre-determined quota.
  - Quotas could be time-limited or renewed periodically.
  - Accounting is centralized.
- **Ticket Buying.**
  - Computing resources are assumed to trust the authorities that allocate quotas.
  - Users purchase tokens from their authority and presents the tokens to the resources as a payment.
  - The token-issuing authorities perform the overall accounting.

- Resource Market.
  - A concept relating accounting and Resource Brokering.
  - Resources or resource centres advertise their resource prices.
  - Prices fed directly to the accounting system to produce the user account status.
  - Accounting and RB determine the optimal resource to run the “job”.
  - Technically a challenging system.

# Current Accounting and Quotas.

Computing accounting, generally collecting usage records such as CPU time.

- **APEL**

- Collects from CE: GIIS, Gatekeeper, Batch system, System logs.
- RGMA transport, central DB, most LCG sites plus some US (by email).

- **DGAS**

- Parses CE PBS, LSF or Torque logs, gatekeeper information.
- Globus GSI, non-centralized DBs, INFN sites, integrated into gLite 1.4.

- **SGAS**

- Based on Grid standards (WSRF, XACML, GGF-UR)
- Runs on SweGrid resources.



# Current Accounting and Quotas.

## Storage and network accounting.

- **Storage Accounting**
  - Persistent (cheap) vs. temporary (expensive) storage. Commercial precedent.
  - gLite SRM and FTS have preliminary features. Not integrated yet.
- **Network Accounting**
  - Networks are not free, costs have to be recovered.
  - FTS maintains data transfer statistics per VO, turned into GGF-URs?

# Current Accounting and Quotas.

## Other EU projects.

- **DEISA.**

- Accounting activities led by the Security technical team.
- Accounting eased by GPFS requirements.
- Currently DEISA collects information on jobs only.
- Network usage for accounting purposes being considered.

- **LOBSTER.**

- Provide a pilot infrastructure for unifying network traffic monitoring and measurements.
- Network monitoring system coupled to standard URs.

# Current Accounting and Quotas.

## Other Grid projects.

- **Nimrod.**
  - Nimrod/G implemented a novel cost/weight model.
  - Price matrices of resource costs for users are defined.
  - Allows resources to load balance by changing the cost weights.
- **SNUPI.**
  - Performance and usage monitoring toolkit for Linux clusters..
  - Uses simple extensions to the Unix monitoring system built into Linux.
  - Resource usage data stored in relational databases.
  - Queried via user interfaces such as a web portal.

# Conclusions and Future.

- **Accounting.**
  - Low level support for collecting CPU-usage information continues.
  - Interoperability between accounting systems is being improved.
  - DGAS to APEL bridge should be finished and brought to production.
  - DGAS can populate APEL databases with anonymized URs.
  - Ownership and normalization of data issues need to be addressed.
  - APEL collects US URs by email.
- **Interoperability.**
  - There is an (APEL, DGAS, SGAS and OSG) effort to standardize URs.
  - Converter (anonymizer) to send data from DGAS to APEL.
  - This cooperation proposes to enforce a set of fields from the GGF-UR standard.
  - The GGF-UR has multiple usage record fields but only one is required
- **Storage Accounting.**
  - Storage accounting relies on the native systems of the storage back-end services.
  - These and the gLite FTS statistics need to be integrated into APEL and DGAS.

- **Networking Accounting.**
  - The network accounting metrics need to be defined.
  - gLite FTS keeps transfer statistics, a good starting point for network accounting.
  
- **Heterogeneous Grid Clusters.**
  - Heterogeneous (vast majority on Grid) clusters are an accounting issue.
  - Scaling factors on a SPEC (floating or int) or similar rating are used to publish performance.
  - Within an accounting block, the same scaling method to collect consistent UR values has to be used.
  
- **Security.**
  - Recommend a JRA3 security evaluation of accounting systems.
  - Generally, URs are derived from information from vulnerable CE LRMS and site logs.
  - Transmission of the URs within each system should be evaluated.
  - The DGAS system uses Globus GSI to transmit signed URs.
  - APEL uses RGMA with authentication, records not secure (yet).
  - The system elements should be evaluated for their resistance to hacking.

- **Quotas (enforcement).**
  - Prevents over-use and unbalanced use of resources.
  - Relatively new concept to Grids, philosophy and importance varies.
  - Ranges from centrally-controlled to consumer-driven quotas.
- EGEE gLite has G-PBox quota enforcement.
- LCG APEL accounting usage records can be used by a quota enforcement system.
- SGAS system does have a built-in quota enforcement system.
- **Security.**
  - A consideration is the accuracy of the URs.
  - Will be discovered empirically as users start to repudiate URs.
- **Policies.**
  - Site reporting?
  - LCG software: APEL is part of the site verification test suite.
  - Users with multiple certificates: problem for security infrastructure and VOs.
  - National regulations on Data Privacy. Anonymization of user info.
    - **User data crossing national boundaries and what happens after?**

## Reviewers Issues.

- Getting the APEL, DGAS, SGAS descriptions correct (Kant, Guarise, Sandgren).
- Description of the APEL-DGAS interoperability (Guarise, Kant).
- Scaling factors for clusters (Kleinwort, Kant).
- Understanding international, EU, national policies (Templon).