



Enabling Grids for
E-science in Europe

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DataGrid Accounting System

Brief overview & DGAS2APEL Interface

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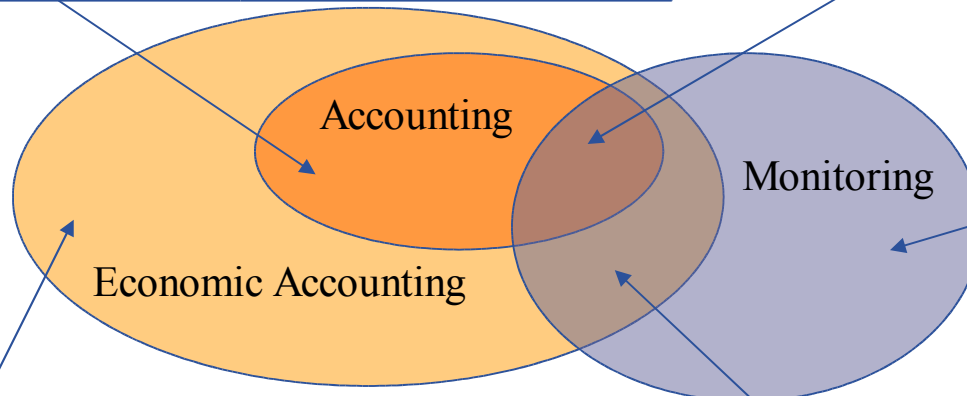
Accounting &/vs. Monitoring

Is accounting nothing but monitoring?

- Accounting is about tracing **single** jobs, file requests, etc. It is about single transactions (and their logic aggregations) associated to **accounts**.
- Grid Accounting requires a **precise mapping** of usage records to grid job IDs and grid user IDs.
- Monitoring can use accounting information. But not only.

- Get/archive Usage Record for a particular job.
- How many jobs has a given User submitted?
- On which CEs did a given user submit his jobs?

- Jobs submitted/executed per VO, per Resource, per Site.
- Does a VO use more resources than it provides?



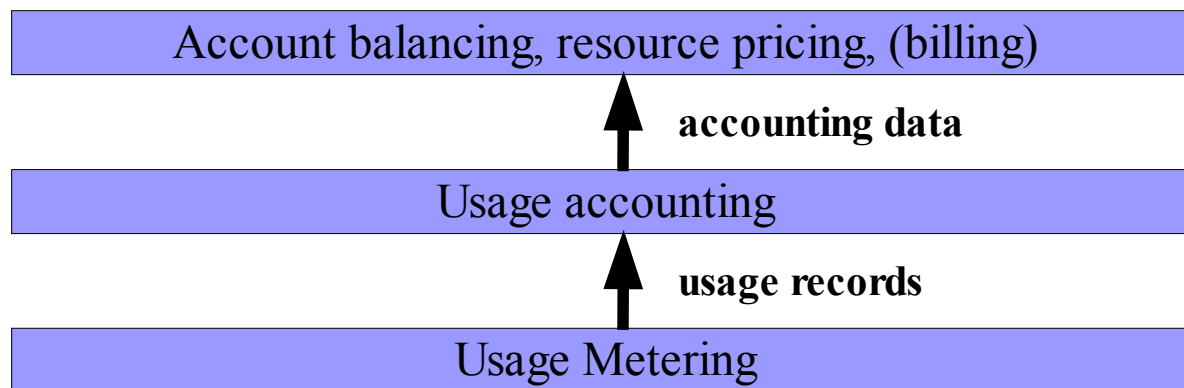
- What is the current CPU load on a CE?
- What is the average QWT on a queue?
- What is the storage occupancy on a SE?
- Are services on a CE up&running?

- Has the user enough credits to submit a job?
- Get account balance.

- Credits spent/earned per VO, per resource
- Does a VO spend more than it earns?

Introduction & Current status

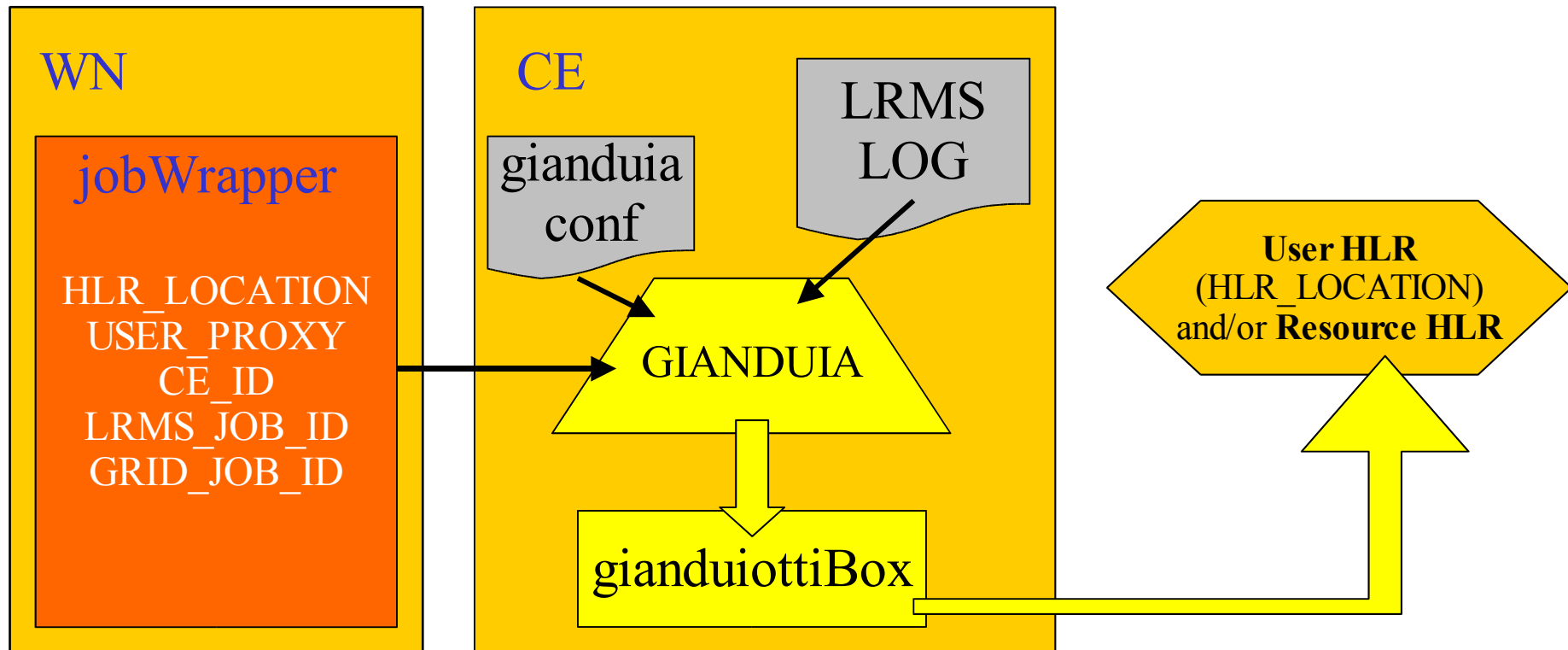
- The Purpose of *DGAS* is to implement **Resource Usage Metering, Accounting** and **Account Balancing** (through resource pricing) in a fully distributed Grid environment. It is conceived to be distributed, secure and extensible.
- The system is designed in order for Usage Metering, Accounting and Account Balancing (through resource pricing) to be **independent layers**:



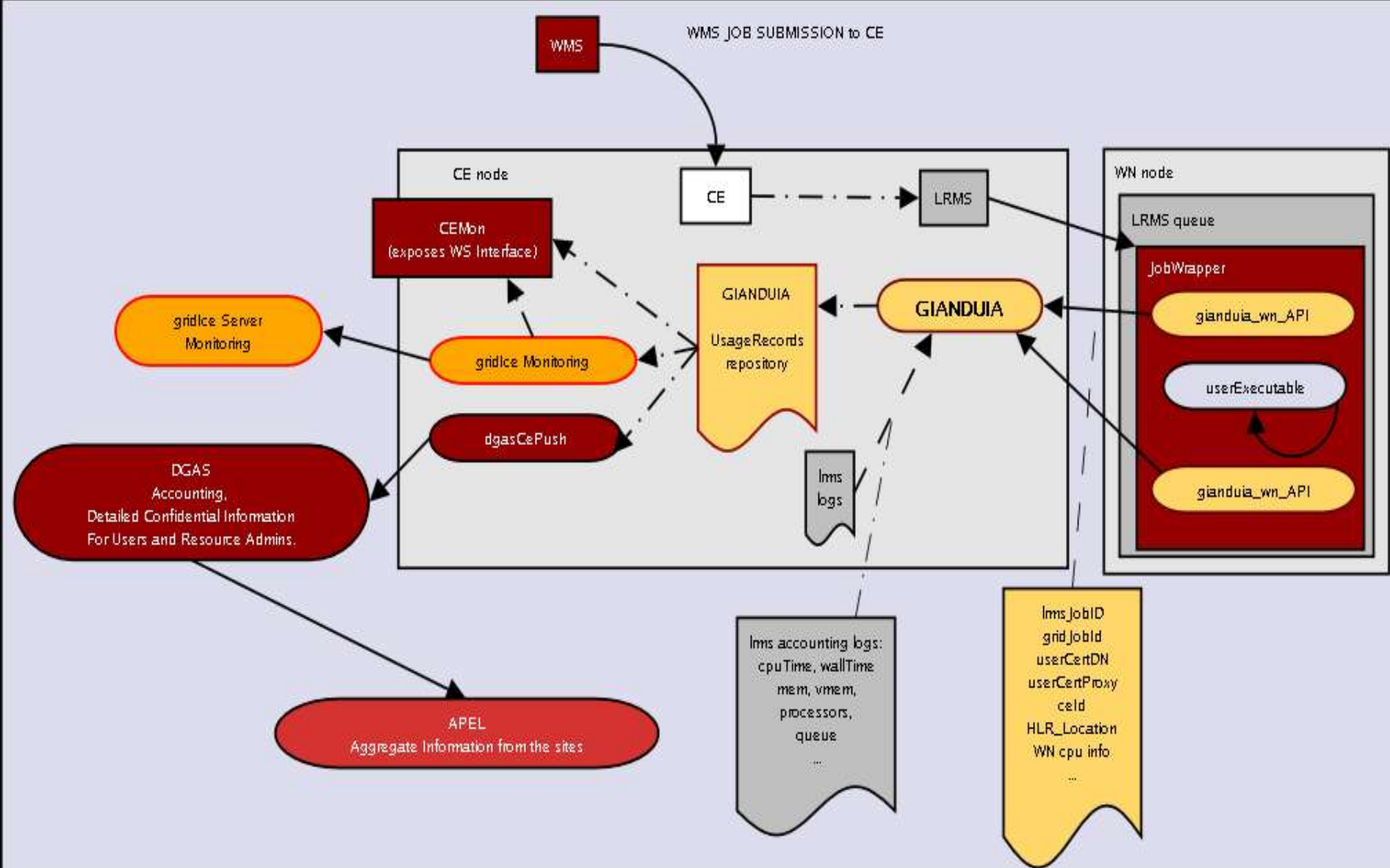
- *DGAS* is to be released with gLite 1.4:
 - compatible with gLite 1.1+ RBs and patched LCG2.x RBs
 - gLite 1.4 HLR/PAs are compatible with *DGAS* sensors on LCG resources (simplifies the upgrade).
- *DGAS* sensors for gLite 1.5(?) will fully support the division of LSF head node and CE.

Metering Infrastructure: GIANDUIA

- GIANDUIA workflow
(Giandua Is A Nice Distributed Usage-metering Infrastructure for Accounting)

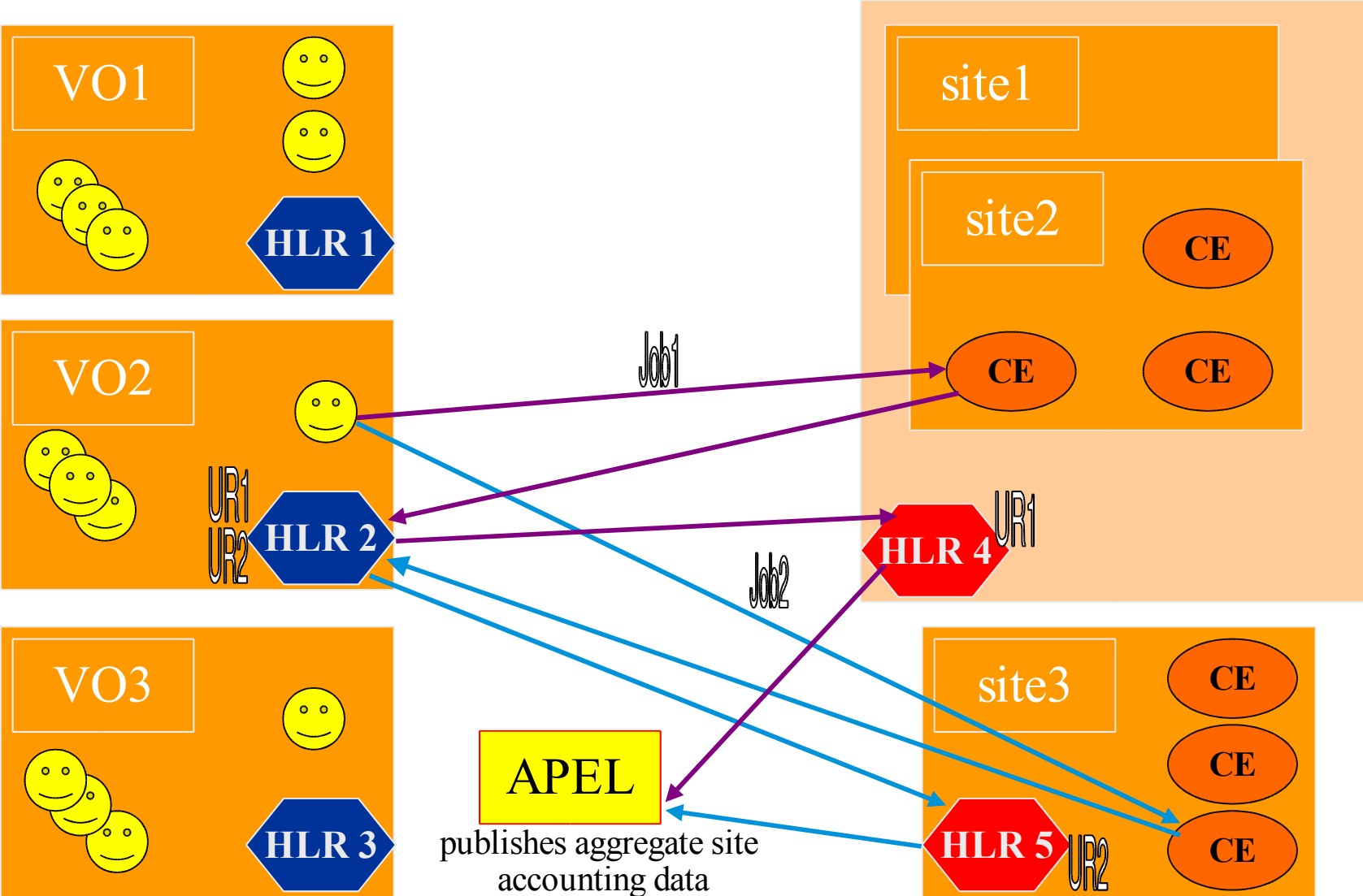


Metering Infrastructure: Gianduia



- The DGAS architecture allows *flexible deployment* schemas. The deployment that we propose is to have:
 - One **User HLR** per VO (or more for VOs with a large number of users).
 - It stores the accounts and usage records for the registered users of the VO. The user specifies the contact string of his HLR in the job JDL.
 - One **Resource HLR** per site, although single HLRs can store information for many sites.
 - These store the accounts and usage records for the registered resources. The contact string is specified on the CE nodes.
 - The **Giandua metering system** installed and configured on the Computing Elements.
 - One or more **Price Authorities** (only if Economic Accounting is desired). There should be one PA per Resource HLR.

DGAS deployment (1)



- DGAS provides a tool that converts its accounting records into the format used by APEL (LcgRecords table):
 - can be **periodically executed** on the Resource HLR;
 - pushes the accounting records to an (either central or local) APEL database;
 - **keeps track of previously converted accounting records** (only new records will be processed if re-processing is not forced);
 - **retries** to convert accounting records with error conditions from previous executions;
 - for reasons of **privacy** the user's certificate subject is not provided (missing authorization mechanism for the access to information published via R-GMA).

- The conversion of DGAS accounting records to the APEL format is one step towards interoperability, **BUT**:
 - very *specific* solution
 - should be considered a temporary “workaround”
- A **common standard** for all accounting systems would be preferable.
 - GGF **Usage Record (UR)** format (based on XML) for the exchange of accounting information? **Problem**: does not contain all required fields, but is extensible (which however might lead to different versions for different accounting systems).
 - GGF **Resource Usage Service (RUS)** interface for communication between accounting systems? **Problem**: 9 draft versions since July ...

DGAS accounting records

- with the DGAS sensors currently installed on INFNgrid (LCG) resources:
 - user's certificate subject
 - user's VO
 - local user ID
 - grid ID of the job
 - CE's grid ID
 - CPU time & wall clock time
 - physical & virtual memory usage
 - accounting timestamp
- with the DGAS sensors of gLite 1.4:
 - user's certificate subject
 - user's FQAN (VOMS certificates)
 - user's VO
 - local user & group ID
 - job ID (both grid and local LRMS ID)
 - CE's grid ID
 - SpecInt2000 & SpecFloat2000
 - number of processors
 - CPU time & wall clock time
 - physical & virtual memory usage
 - accounting timestamp
 - execution start/end timestamps
 - ctime, qtime, etime
 - job's exit status

- **Privacy:**

- Only *authorized (!)* access to accounting data (users, resource admins, VO admins).

- **Security/Reliability:**

- Usage records transmitted from CE to the User HLR using the *user's proxy certificate*.
- Usage records stored by both User HLR and Resource HLR (only the Resource HLR for local accounting).
- User HLRs accept usage records only for registered users.
- Resource HLRs accept transactions only for registered resources and only from trusted User HLRs (or directly from the resource for local accounting).
- Usage Record transmissions and transactions between HLRs are *asynchronous* and in case of failures (e.g. temporary network problems) are retried.

- **Scalability:**

- *Decentralized* infrastructure with an arbitrary number of HLRs/PAs.

- **Accounting for Resources and Users**

- both site managers and users should be able to access information on their jobs (resource level reporting and user level reporting).

- *Further information and documentation about DGAS can be found at:*
<http://www.to.infn.it/grid/accounting>
- *EGEE/gLite User's Guides for DGAS components:*
<http://jra1mw.cvs.cern.ch:8180/cgi-bin/jra1mw.cgi/org.egee.jra1.deliverables/users-guide/>