

The D-Grid Billing Framework

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- What is Billing?
- Motivation of Billing in D-Grid
- Results of the requirements analysis
- Concept for a Billing-Framework in D-Grid
- Open questions
- Conclusion

Basically:

- Limiting access to resources and services to those who have enough credits (or money) to „pay“ for the resources or services
- Users of resources and services take a share of the costs of the resources and services they are using
- Resource and service providers charge the costs for their resources and services

Questions to be solved:

- Which and how many „currencies“ are used for charging these costs?
- Who keeps accounts for the „money“ (or equivalent) and how?
- How does this work together with other services, providers, users, etc.?
- What additional services are necessary in this context?

What does it not include? (which is still necessary...)

- **Accounting:** determining who used what for how long
- **Pricing:** determining resource and service prices / price equivalents
- **Service-Level Agreements (SLA):** determining the conditions under which a contract on resource or service usage is made

- **Why Billing in D-Grid?**

- allows control of resource usage by regulating access to resources via distribution of Grid Credits or (real) money
- commercial users from industry shall share the cost of D-Grid infrastructure and services
- D-Grid users shall eventually also share the cost of commercial resources and services attached to D-Grid (e.g. valuable data, software licences, etc.)

⇒ so we need Billing in D-Grid

⇒ and therefore also

⇒ Accounting

⇒ Pricing

⇒ SLA Management

Resource provision currently

- only within community (except special invest resources)
- no compensation for resource providers

Readiness for resource sharing with users / providers from other communities

- generally very low
- expectation of compensation => need for billing

Main obstacles on the way to resource sharing

- legal issues (mainly data protection laws)

D-Grid currency preferences

- 2 communities say they need real money
- majority: virtual D-Grid currency

Pricing

- common sense: no central regulation
- apart from that: total diversity of opinions

Banking service

- mostly controversial
- majority prefers decentralized banking service

Grid-Infrastructure

- GT4, Unicore 5, gLite (each at all special invest sites)
=> support for all three required
=> Grid service approach necessary

Accounting/Billing Infrastructure Components

- SGAS, APEL, GRASP, gLite Resource Broker, proprietary custom tools in computing centers
=> maximum diversity!
=> Grid service approach necessary

Resource Usage Records

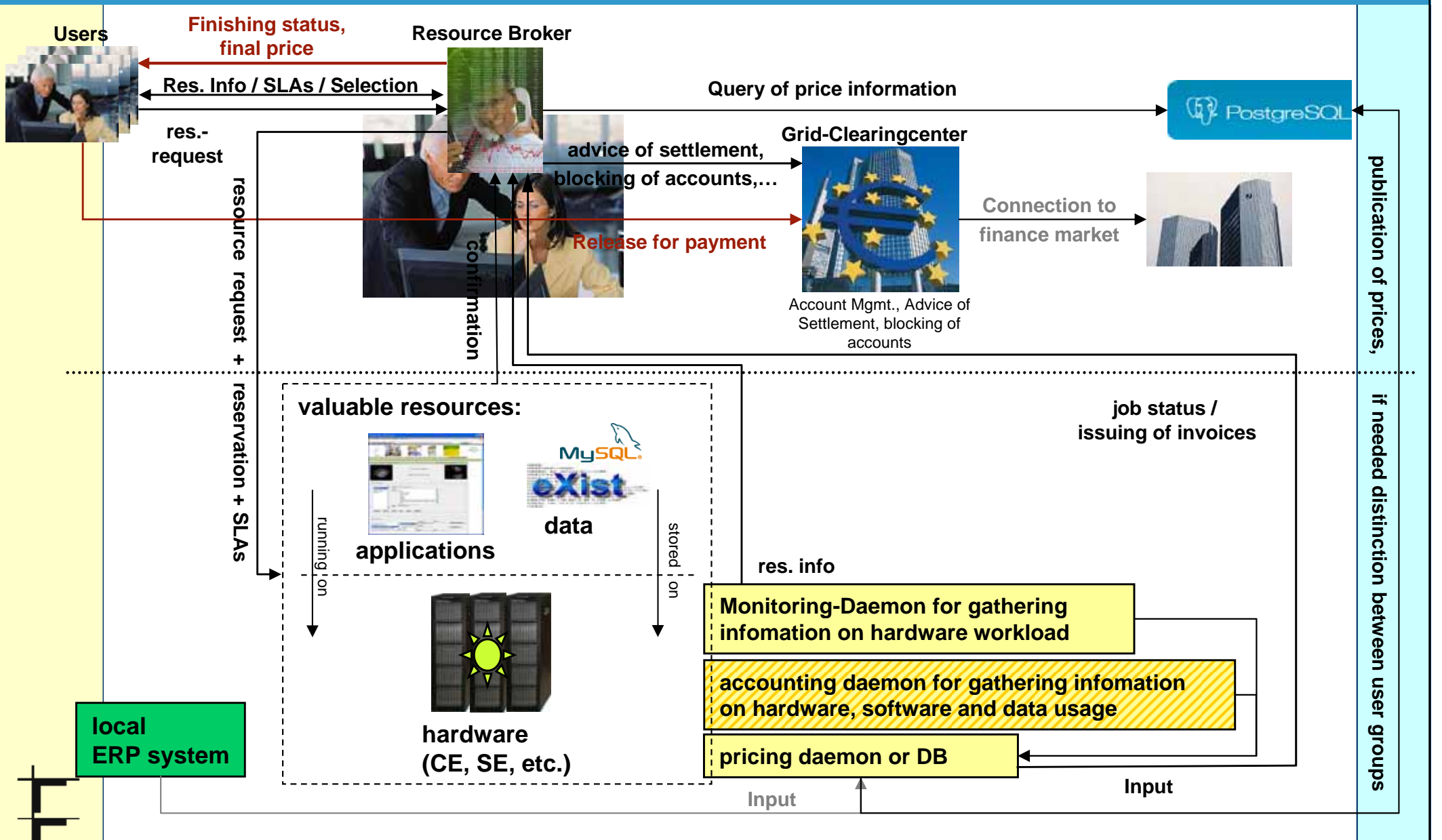
- unclear how they will be produced and in what format(s)
- Proposed solution (End 2006): OGF-RUR

Security Infrastructure

- PKI-based A&A
- GridShib-based A&A

Roadmap:

- we need to agree on the cornerstones of a service infrastructure for accounting and billing
 - what will be billed?
 - what types of components / services / daemons will be involved?
 - what is optional and what is required?
 - who makes the pricing?
 - what „currencies“ will be supported?
- then the interfaces shall be defined in detail
 - which data / data types are exchanged between the different components / services / daemons?
 - what protocols will be supported?
- development / implementation
 - every player is free to use the system he likes as long as it provides the interfaces defined for D-Grid
 - one reference implementation should be provided



Options

- One or more Clearing Centers:
-> low complexity vs. high complexity
-> **recommendation: start with one**
- Resource Broker or not:
Virtualization vs. no virtualization
(i.e. „to Grid or not to Grid“...)
-> **recommendation: start with (only) one**
- Grid Workflow Management / Multisite-Job-Submission:
someone has to control job submission and execution in multi-site
Grid jobs! (also: complex single-site jobs...)
-> **recommendation: start with (only) one**
- pricing daemon vs. price database:
flexibility vs. easy solution
-> **recommendation: start simple, use a database**

⇒ keep it simple as long as you can!

⇒ raise complexity afterwards



Security relevant data

- Accounting data:
 - should never leave the resource or service provider, except for user invoice („directly“ to the user)
 - should be used to define prices locally
- Monitoring data:
 - might be interesting for competitors in order to find out about product development status (indicated by huge jobs / large data...)
- „Bank“ account information:
 - should never leave the Clearing Center, except for
 - user-self-info
 - Resource Broker needs to know account ID for advice of settlement and blocking of accounts

Not security relevant data:

- Resource / service price information:
 - should be publically available

- issuing an invoice (for real money)
 - requires a legal person
 - computing centers are not legal persons
- efficient utilization of resources
 - free price regulation by providers necessary if no guarantees for resource consumption are given
 - overbooking of resources necessary
 - legality of such measures unclear
- multi currency system
 - strict separation of currencies necessary
 - consequences for interoperability between funded resources and commercial ones
- pricing requirements for funded resources / virtual currencies
 - control body and rules for distribution of usage budgets necessary
 - resources need to be comparable
- leading edge problem
 - in a real market no risks will be taken
=> no investments in leading edge technology

- liability issues
 - breakdown / blackout of resources:
who takes the risk?
=> provider vs. user vs. insurance
- providing funded resources to commercial users
 - commercial users should pay for funded resources
 - who gets the money then?
 - is this kind of competition lawful or is it hidden subsidy
- providing commercial resources to funded users
 - currently not probable as unattractive to commercial providers
 - but in case: how do funded users get the money for consuming commercial resources
- pricing model(s)
 - micropayment (providers favourite)
 - fixed prices
 - flat rates
 - ...

- Billing is necessary in terms of
 - controlling resource usage
 - interacting with industry
- Cornerstones of billing infrastructure are clear
- Necessary next steps:
 - agreement on cornerstones
 - agreement on interfaces between components of a billing infrastructure
 - massive requirement for development / implementation of software / service components