Grid Economy
Allocation and Accounting

Session Chairs

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Cycles4free?

There are no free computer resources!

- CPUs
- Storage
- Bandwidth
- Software
- Support

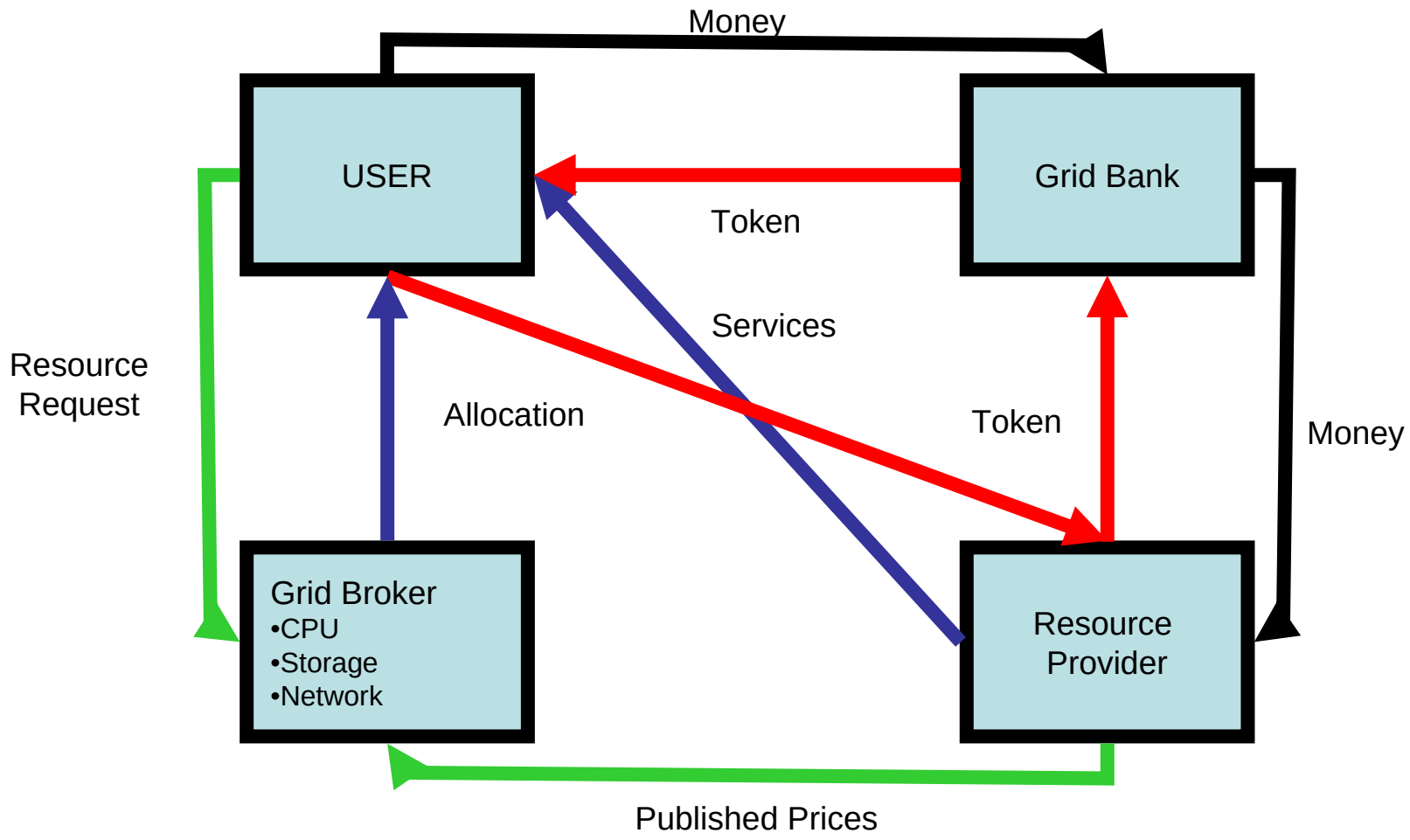
So far the incentive for connecting resources on the Grid has been primarily research/development and politics.

Now we have to deal with the real cost

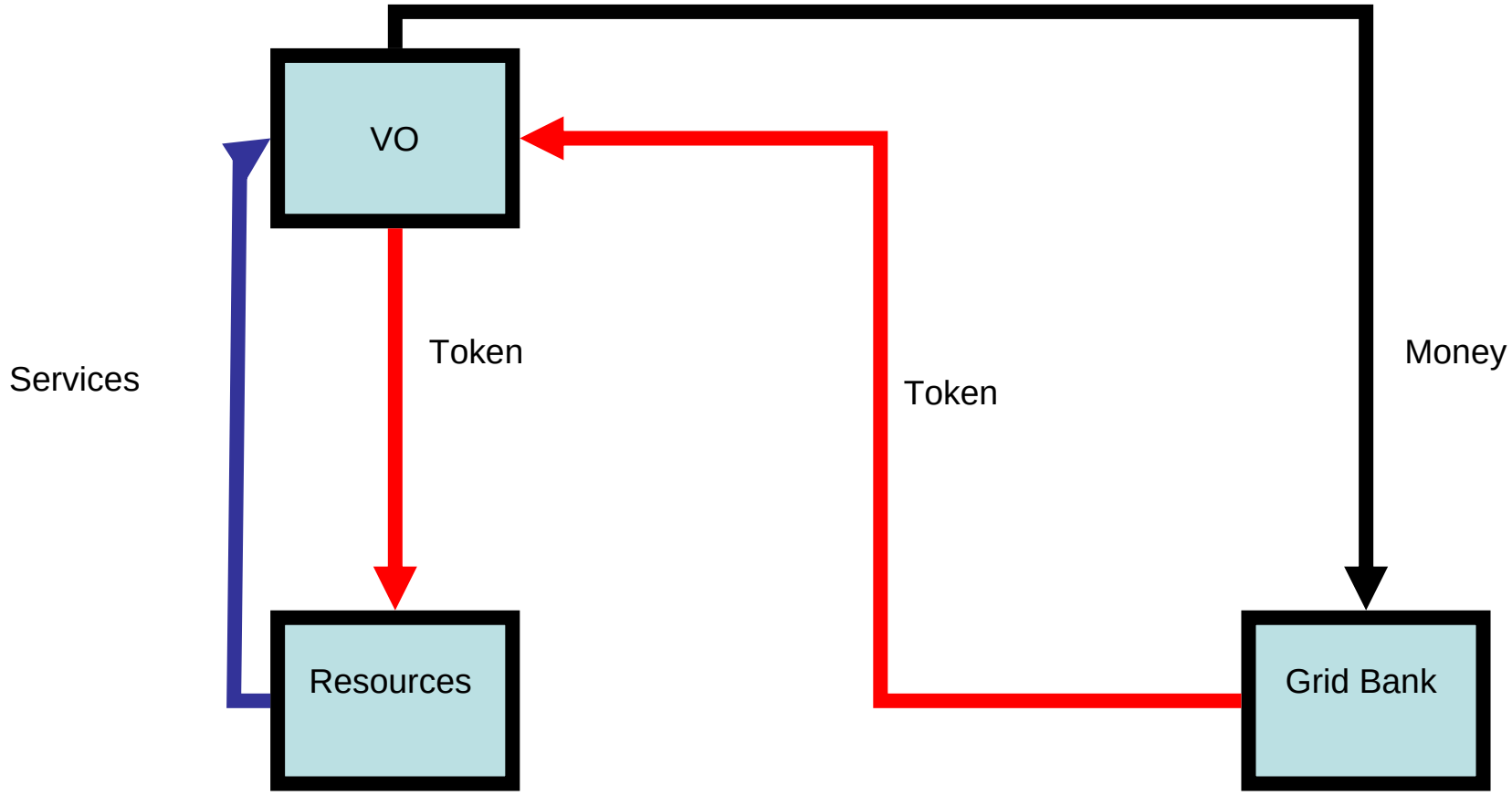
Allocation mechanisms

- **Pooling of real funds**
  - **Users pay service providers in exchange for resources**
- **Allocations committee**
  - **Users apply for “credits” from funding agencies**
- **Bartering agreements**
  - **Users exchange resources through bilateral agreements**

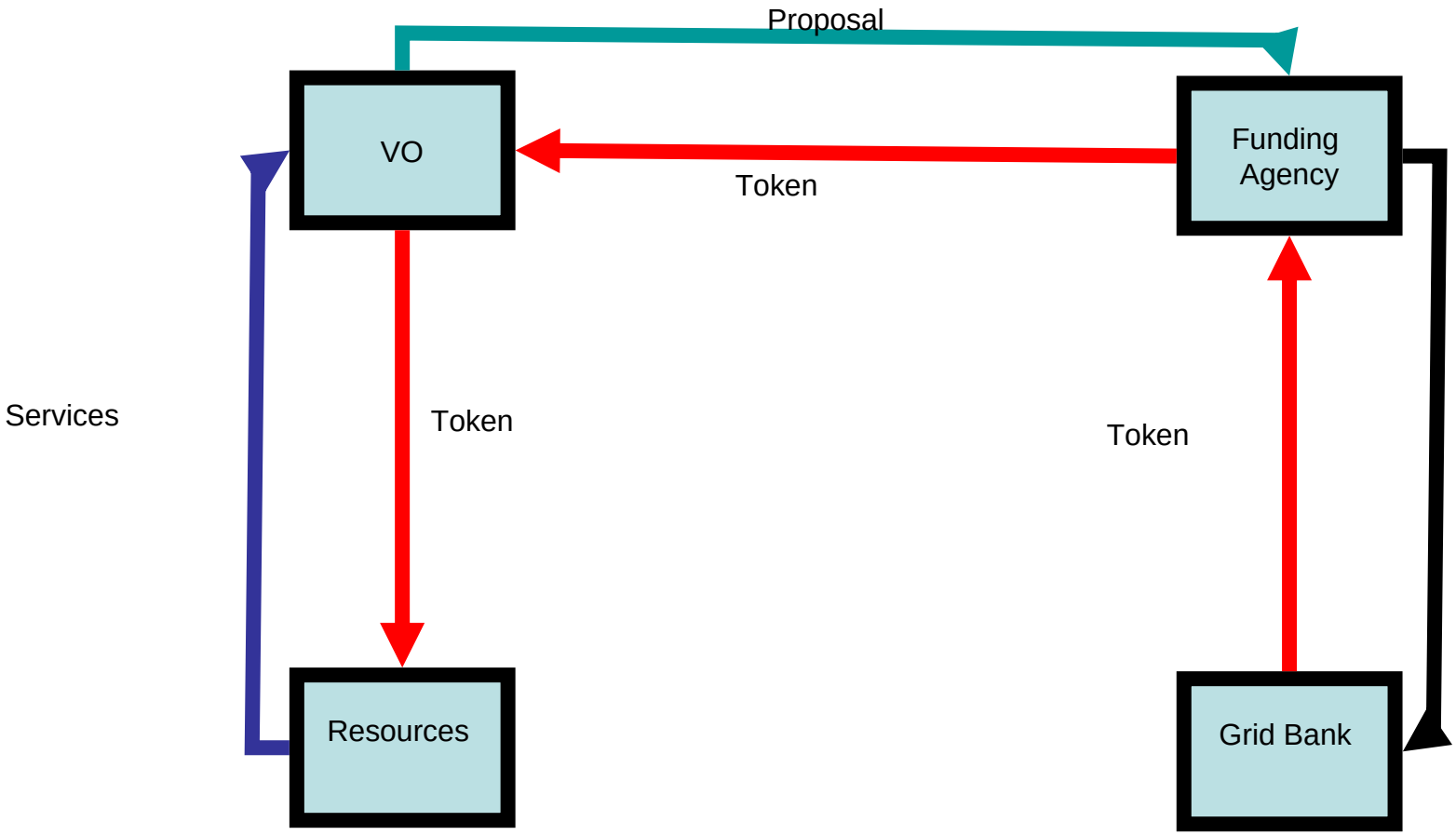
One Economic Model - Buyya



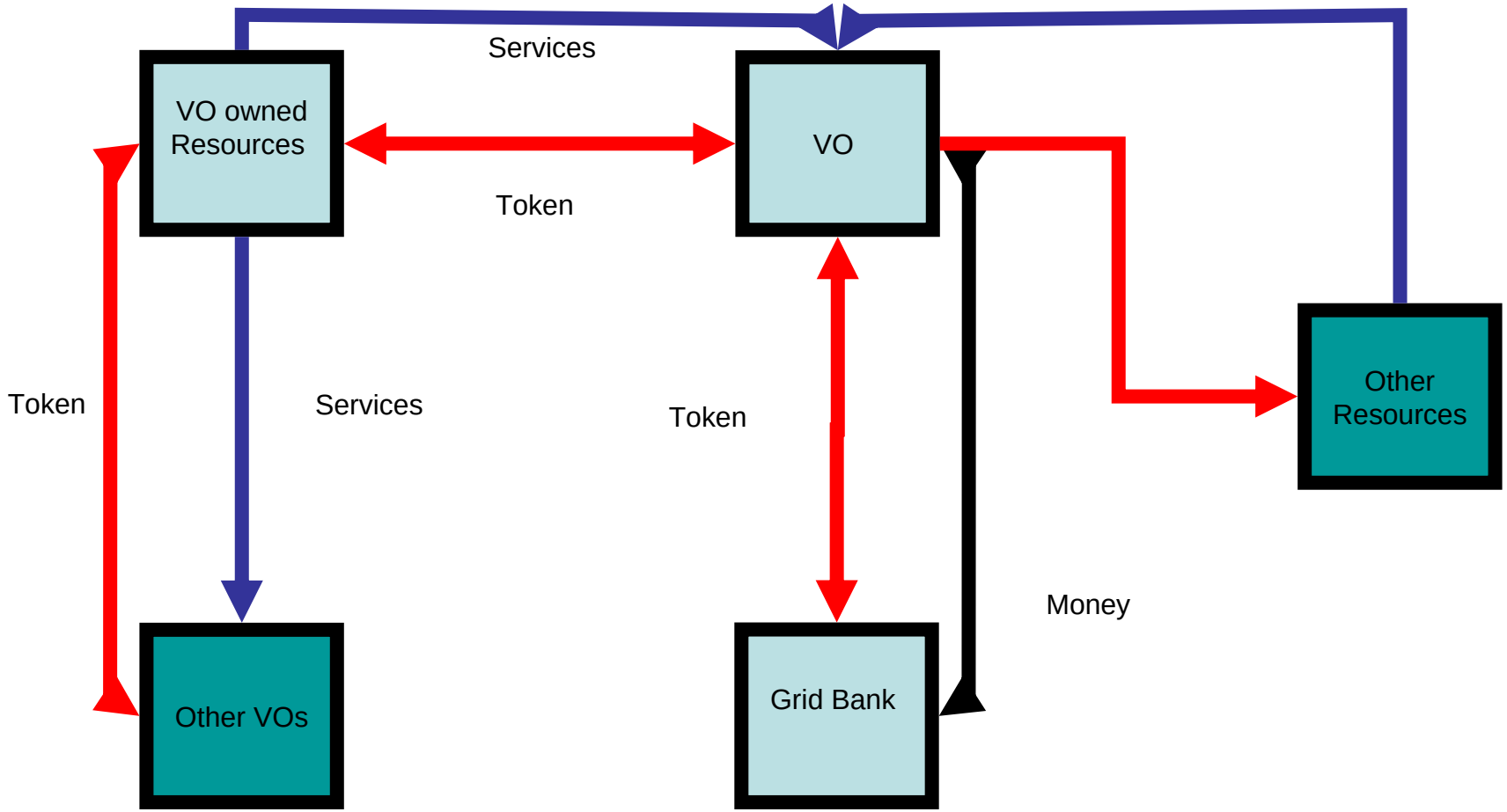
CASE 1: Pooling of real funds



CASE 2: Allocations committee



CASE 3: Bartering Agreements



Accounting

Is the mechanism providing the information gathering, storage and exchange needed in the Grid economy

Accounting – Resource Provider

- Grid Resource Provider Rates:
  - This can be done according to local policy
- Provide Quotes for resource allocation requests:
  - An agreement on the format of this information must be found
- Track Resource Utilization:
  - Grid resource providers must collect information on Grid credits collected from resource consumers
- Job Account Information:
  - Information sent back to the resource consumer

Accounting – Resource Consumer

- Resource Usage Quote Request:
  - This should be a request in a common agreed upon format that specifies the resources requested
- Accountable Resource Use Request:
  - If a resource consuming entity decides to use a resource provider site
- Resource Request Quote Cancellation:
  - if the requesting site decides to use the successful bidder for a job, a cancellation should be sent to all the resource providers that provided a quote whose resources are not going to be used

Account balancing - bartering

- the resulting resource utilization charges are viewed as a debit to the submitting (consumer) site. The consumer's home site can then decide how to charge the user's authorized project and individual account.
- the resulting resource utilization charge is handled as a credit to the resource provider (supplier) site. This entitles jobs at the supplier's site to use an equivalent amount of Grid resources at the consumer's site.

Usage records

- what information about users and usage should be collected and how to assure compliance with privacy acts etc?
  - **User information:** user name, affiliation, affiliated researchers/collaborators, (research) project, funding source(s)
  - **Research categorization:** to match funding agencies classification. Some systems may have restricted use, i.e. some types of research is disallowed on certain systems (because of security concerns, restrictions by funding source, proprietary isses, etc.)
  - **Results tracking:** publications, presentations, proposals
  - **Resource usage:** Time on system, number of nodes used, memory used, storage used (temp., online, archival, backup), max. per job, integrated per job, total number of jobs, weekly, monthly, network bandwith consumed (volume moved, rates achived, endpoints ...), efficiency of resource use (CPU, I/O, networks)

Usage records

- Formats for representation of this information so a non-invasive Grid accounting system can supplement local accounting systems (Web services) are needed
- Access rights to different data collected for different constituents (public, users, agencies, sysadmins, resource owners/providers) must be decided upon
- Reporting/dissemination forms for the different constituents
  - Web pages
  - File downloads
  - e-mail
  - API for computer access (other than through manual web access);

Current Accounting Status

- Progress on metering:
  - Most Grids have their own systems which is disappointing in the lack of cooperation but at least they have them. I am aware of DGAS (Italy, EGEE), SGAS (SweGrid), APEL (EGEE) TeraGrid, and OSG.
- Usage Record standards:
  - There is scope for exchange of records and aggregation from multiple grids at a higher level. (APEL/ DGAS), and (APEL.OSG/TeraGrid) (SGAS/APEL). In the longer term the GGF RUS offers standard WS interfaces for this.

Conclusions

- No single unified allocation service is required
  - local/national/international
  - funding agency/bartering/pooling
  - Ownership defines allocation model
- Several research-level Grid economy systems presented
  - Difference between Grid economy and accounting is blurred
  - Most assume unified allocation or ignores allocation diversity
  - Resource brokering by various market mechanism, auctioning, commodity markets, bartering.
  - Many economies will probably have to co-exist?
- Accounting/metering is becoming available on Grids
  - Many different implementations
  - Emerging standards on usage records?
    - what information about users and usage should be collected and how to assure compliance with privacy acts etc?
  - No interfaces to full fledged Grid economies, need for economy enabled accounting

Recommendations

- Scalable resource allocation mechanism(s) must be included in the design phase of the Sustainable European Grid
- A versatile Grid economy model supporting those allocation mechanism(s) for a large number of small VOs should be developed and influence the design and implementation of the Sustainable European Grid
- An accounting policy and standard that enables interoperability must be developed immediately, but be based on the vision of Grid Economy
  - eIRG
  - GGF
  - Accounting system developers

e-IRG Task Force?

AUSTRIAN GRID

e-IRG
e-Infrastructure Reflection Group

NDGF

NorduGrid
ARC

NGC

Management
Policy
Middleware

NorduGrid
NDGF

CA
Authorization
Accounting
Storage?

NorGrid

DCGC

SweGrid

FinGrid