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# “Grid Accounting”

## eIRG Workshop

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# “Grid Accounting” Outline

- Introduction
- Global Grid Forum’s OGSA-WG
- “Immature” Grid Technologies
- Agreement & Virtual Organization
- Secure Logging and Audit
- Accounting “Language”
- Grid Accounting Summary



# The Globus Alliance

*Making Grid computing a reality*

- Close collaboration with real Grid projects in science and industry
- Development and promotion of standard Grid protocols (e.g. OGSA) to enable interoperability and shared infrastructure
- Development and promotion of standard Grid software APIs and SDKs to enable portability and code sharing
- The Globus Toolkit<sup>®</sup>: Open source, reference software base for building Grid infrastructure and applications
- Global Grid Forum: Development of standard protocols and APIs for Grid computing



# The Grid World: Current Status

- Many major Grid projects in scientific & technical computing/research & education
- Open source Globus Toolkit™ a de facto standard for major protocols & services
  - ◆ Simple protocols & APIs for authentication, discovery, access, etc.: infrastructure
  - ◆ Information-centric design
  - ◆ Large user and developer base
  - ◆ Multiple commercial support providers
- Global Grid Forum: community & standards
- Emerging Open Grid Services Architecture

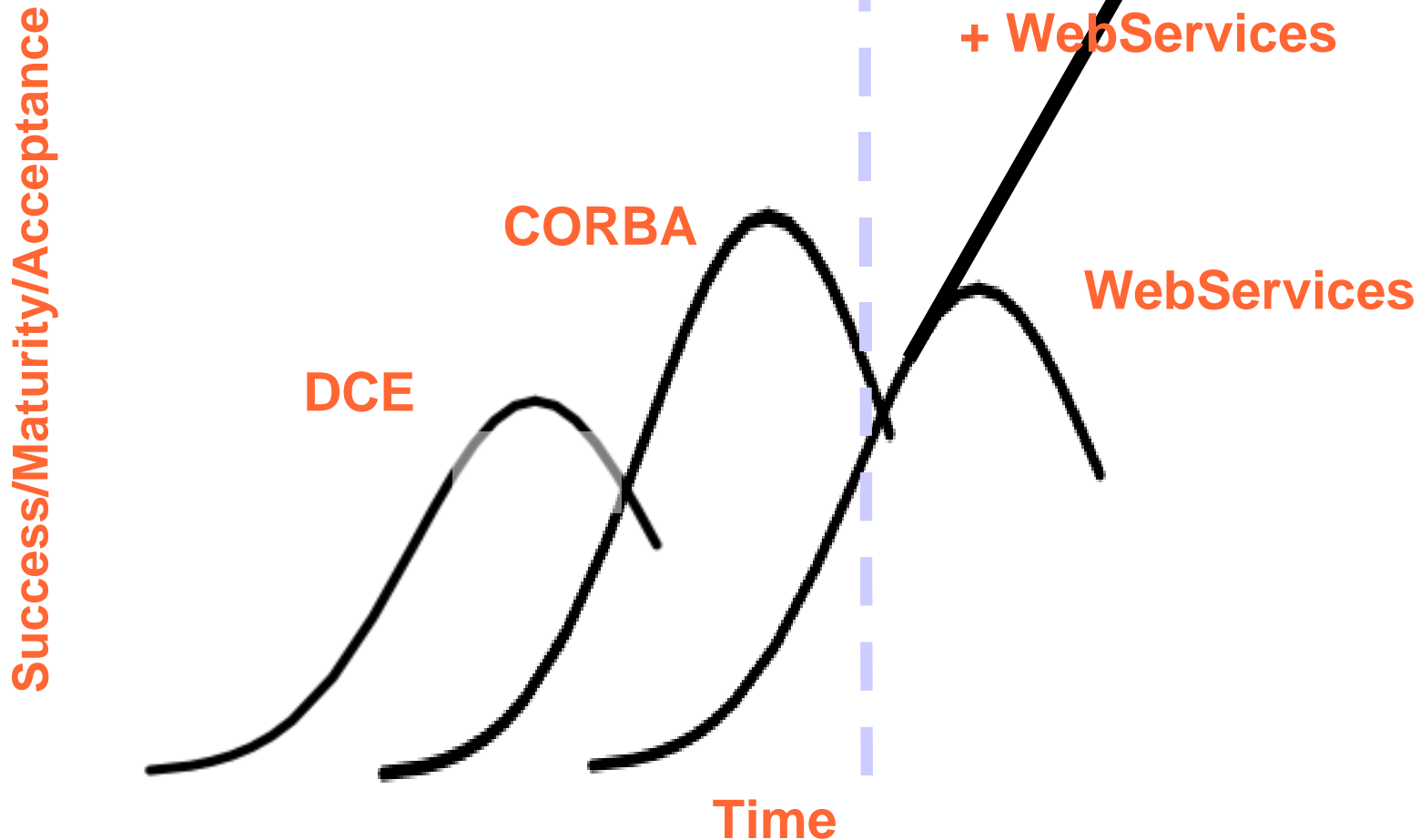


# Open Grid Services Architecture (OGSA)

- A standard substrate: the Grid service
  - ◆ WS Resource Framework (OASIS)
  - ◆ Web services interfaces and behaviors that address key distributed system issues
- ... supports standard service specifications
  - ◆ Resource mgt, dbms, workflow, security, ...
  - ◆ Target of current & planned GGF efforts
  - ◆ OGSA-WG defines “OGSA compliance”
- ... and arbitrary application-specific services based on these & other definitions



# Silver Bullet Hype-Curve...





# OGSA-WG: Auditing, billing and logging services

“Auditing, logging, and billing services are critical for success of OGSA outside of academia and government. This will include the ability for schedulers to interact with resources to establish prices, as well as for resources to interact with accounting and billing services. Logging is the basis of the whole chain:

- Metering is using the log to keep track of resource usage.
- Auditing is using the log in persistent fashion, possibly non-repudiation as well.
- Billing is **yet another service, not defined by OGSA**, that may use auditing and/or metering logs and other data to generate bills, or chargeback.”



## OGSA Spec & Accounting

- OGSA Spec “identifies” accounting services as a requirements
  - ◆ Not very detailed...
  - ◆ Clear that commercialization needs it
  - ◆ Not a lot of push (yet) for escalation
- ...more relationships and dependencies of Accounting with other “immature” Grid technologies...





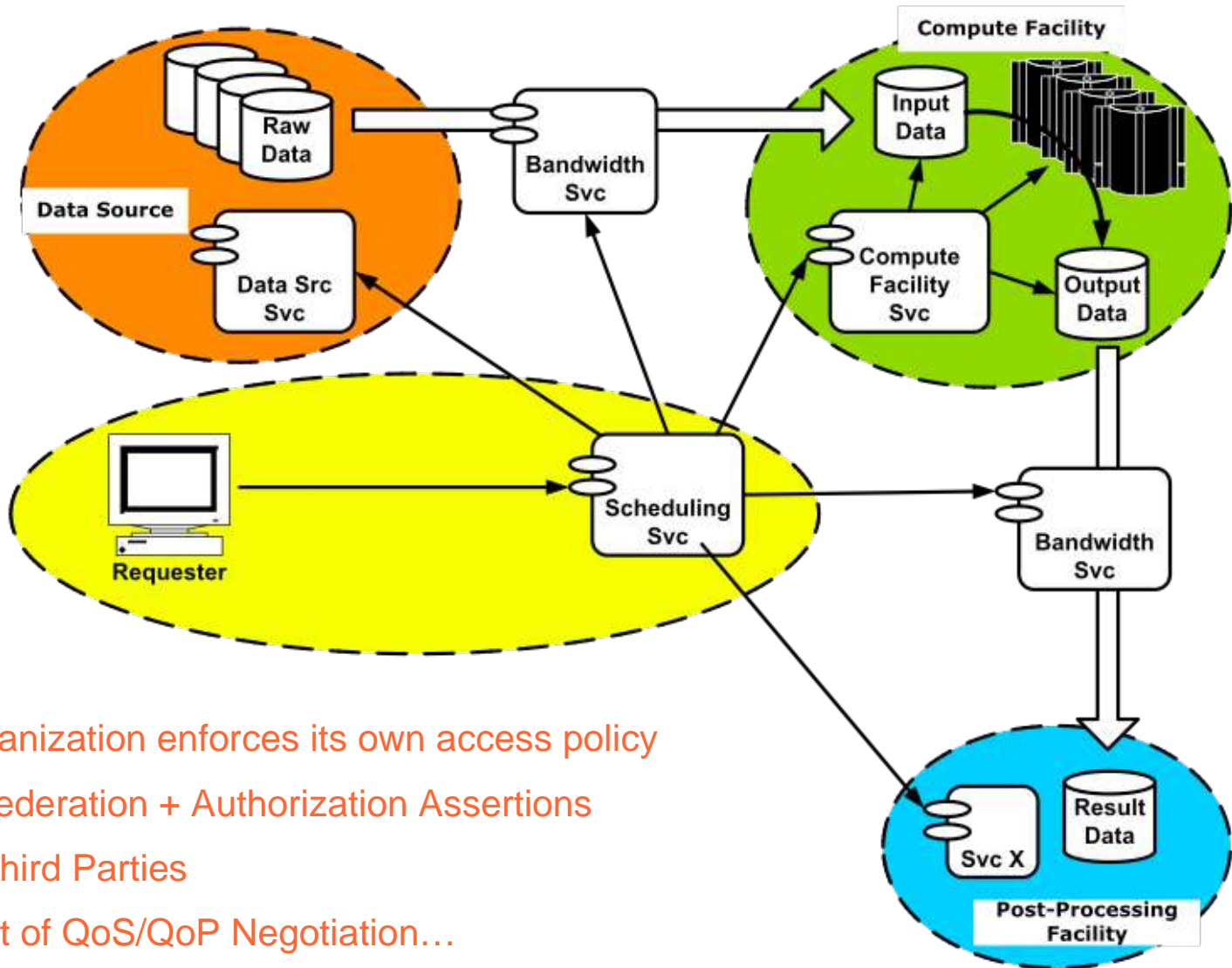
# “Immature” Grid Technologies

- Agreement (Virtual Organization)
  - ◆ Expression of, negotiation
  - ◆ Context of agreement
- Policies
  - ◆ Derived from agreement
  - ◆ Complex expressions, transparent enforcement
- Secure Logging and Audit
  - ◆ Transparent selective logging
  - ◆ Reconciliation of logs from different domains
- Accounting...

**Accounting very much related to and dependent on Agreement, Policy and Logging**



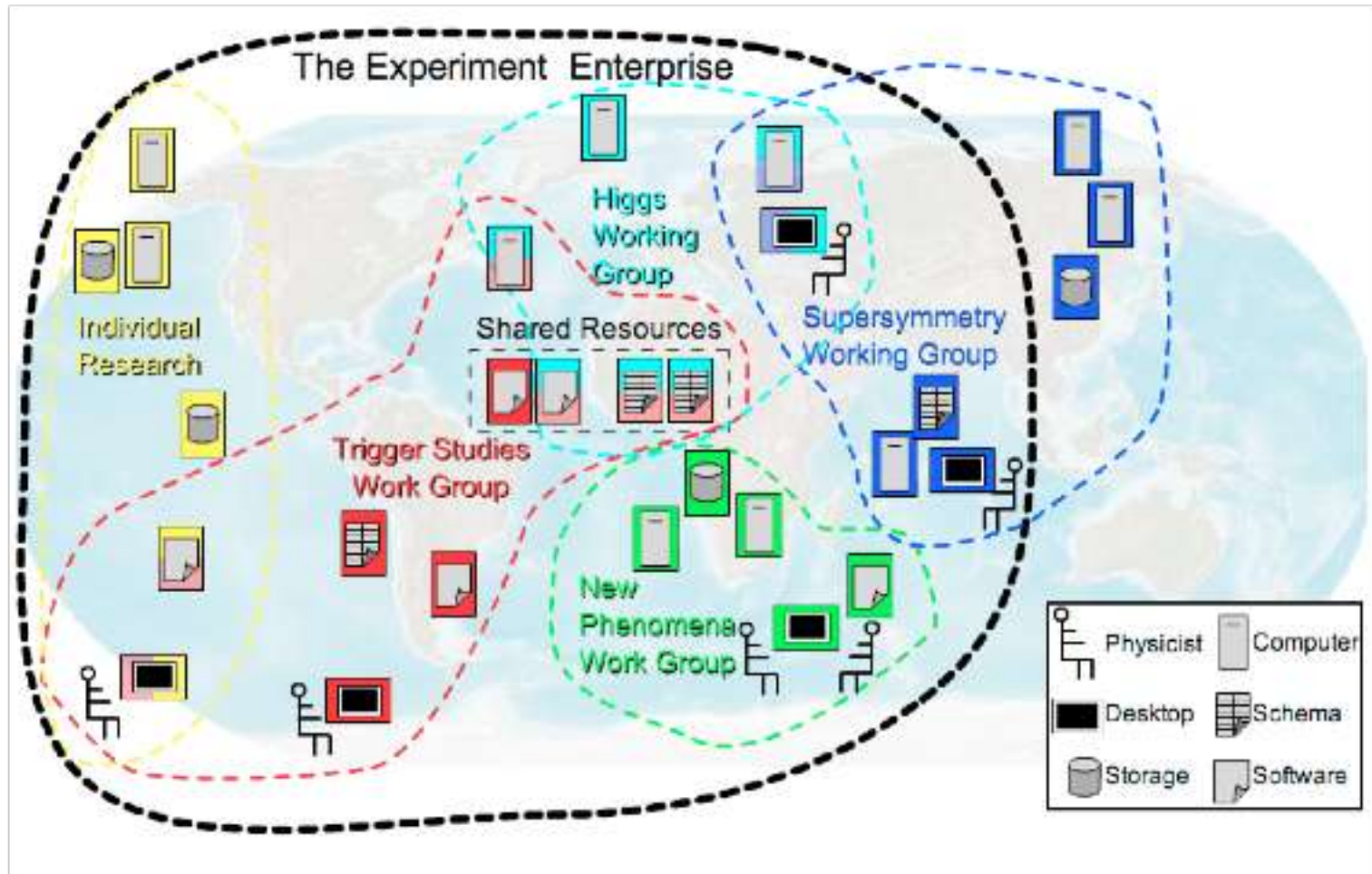
# Grids: Multiple Independent Orgs



- Each Organization enforces its own access policy
- Identity Federation + Authorization Assertions
- Trusted Third Parties
- It's all part of QoS/QoP Negotiation...

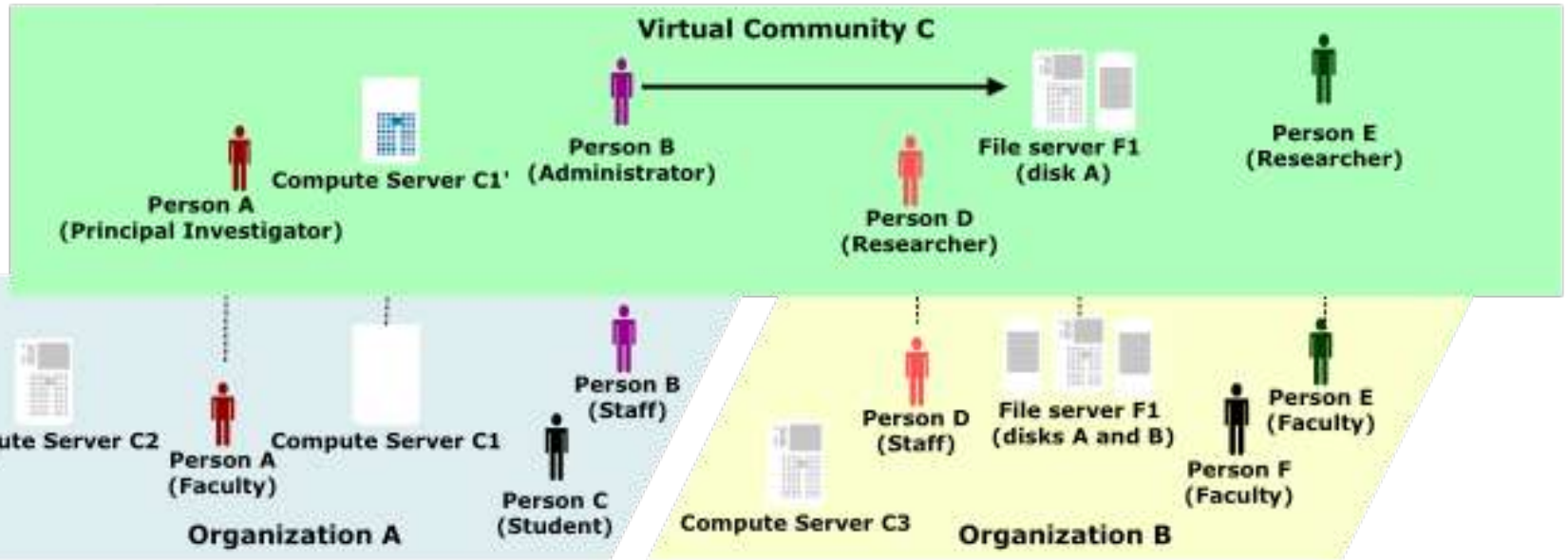


# Objective: Enable Cross-Organizational Collaboration





# Virtual Organization Concept





# Agreement ↗ VO Security Policy

## (Business) Agreement

Price  
Cost  
Obligations  
QoS  
T&Cs

.....  
Security  
.....

## Static Initial VO Security Policy

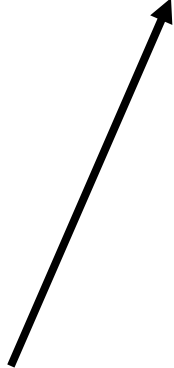
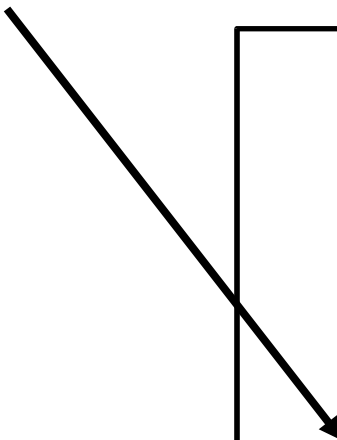
trust anchors  
(initial) members  
(initial) resources  
(initial) roles

Access rules  
Privacy rules

## Dynamic VO Security Policy

members  
resources  
roles

Attribute mgmt  
Authz mgmt





# Agreement ⇨ VO Accounting

## (Business) Agreement

Price  
Cost  
Obligations  
QoS  
T&Cs

.....  
Accounting  
.....

## Static Initial VO Accounting Policy

(trust anchors)

Pricing

“Currency”

Bank/Billing Svcs

Metering Svcs

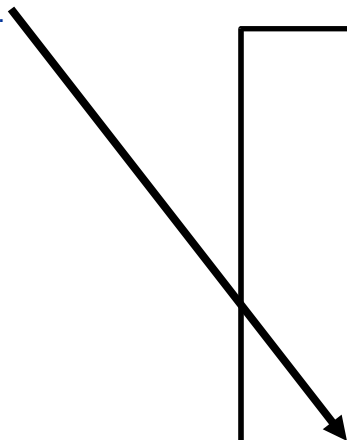
Access rules

Privacy rules

## Dynamic VO Accounting Policy

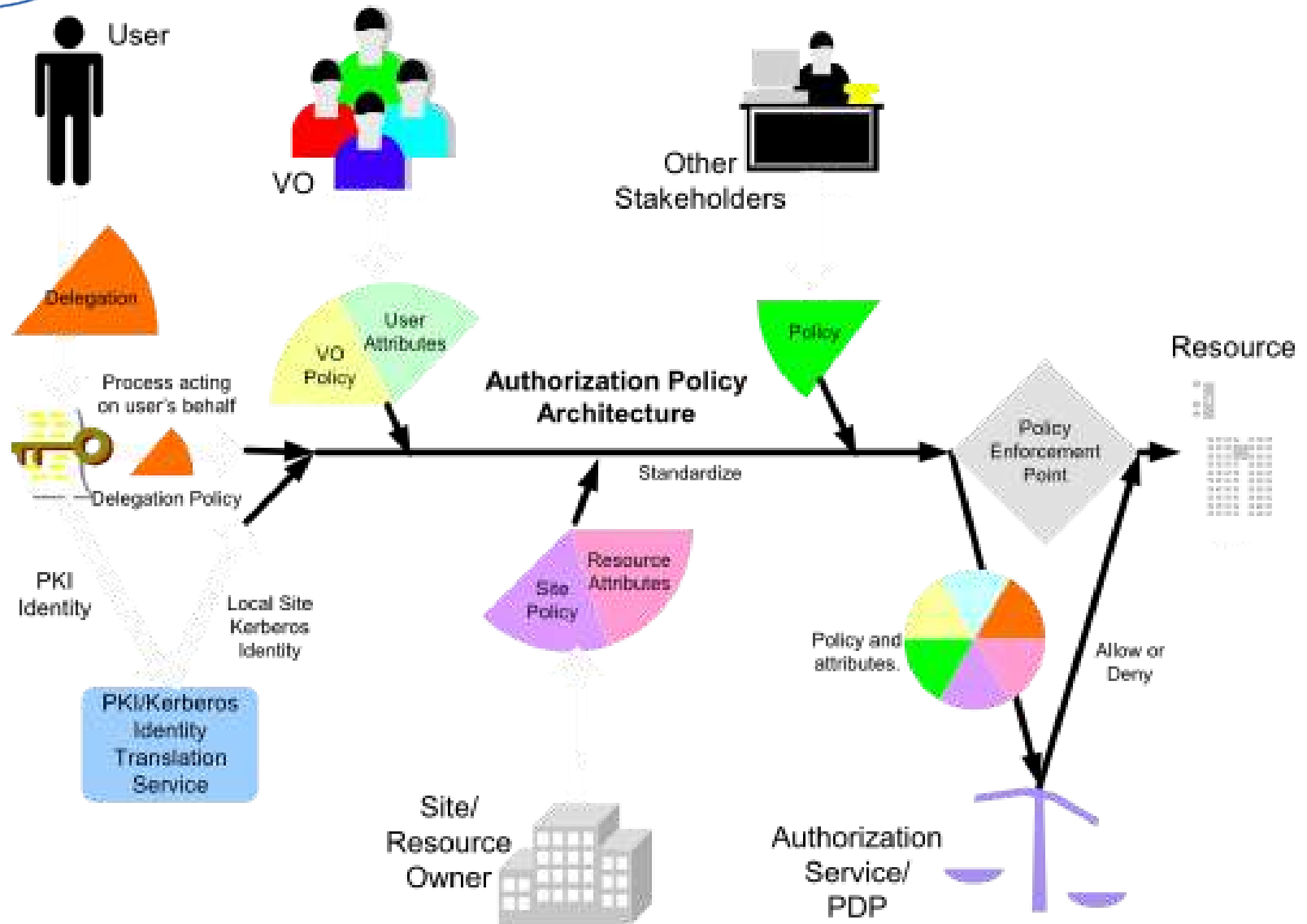
members  
resources  
roles

Attribute mgmt  
Authz mgmt



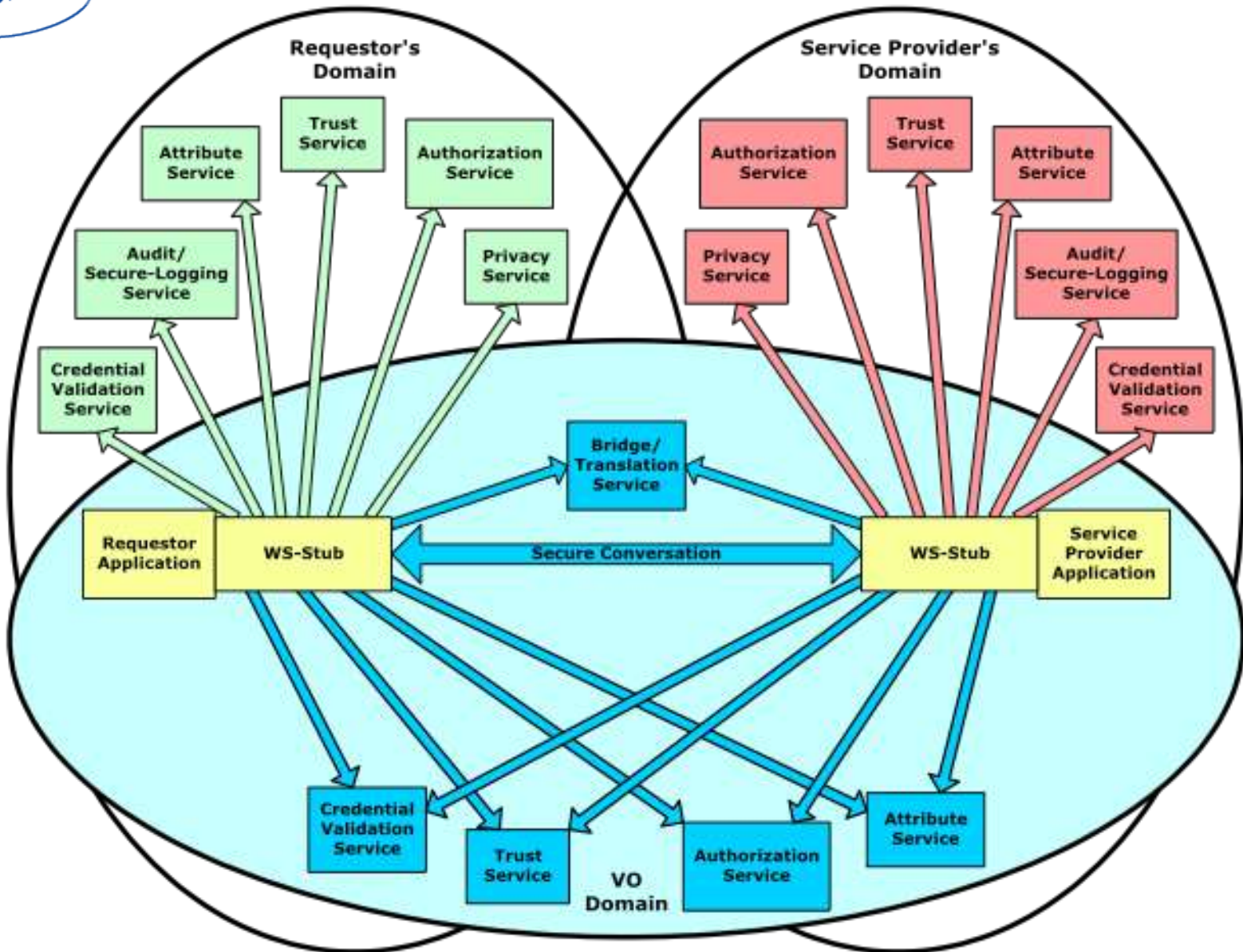


# Policy Decision and Enforcement Example





# OGSA Security Services with VO





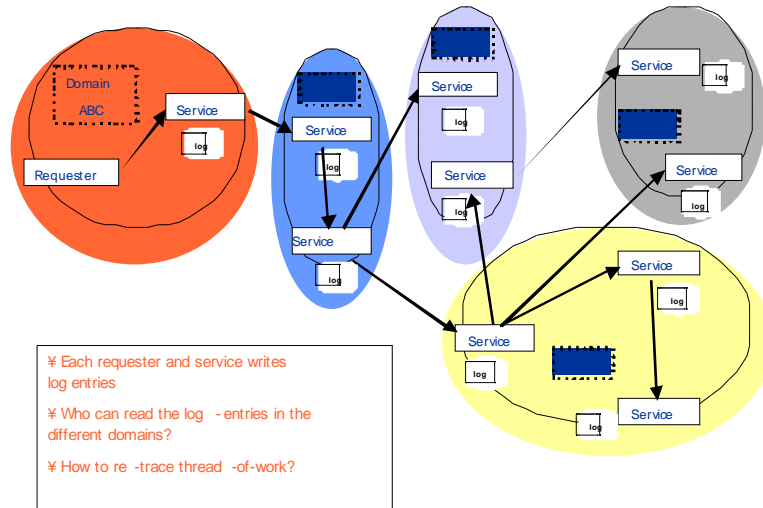


# “Transparent” Grid Accounting

- How transparently to enforce “Agreed Usage”?
  - ◆ How much can we do in the runtime?
- Can we leverage the security policy enforcement?
  - ◆ That will be in place...
- Secure Logging and Audit
  - ◆ Transparent selective logging
  - ◆ That is in the plans...
- Is introspection of request context rich enough?
  - ◆ Client/WS-Resource/portType/operation/...
  - ◆ WS-Properties...
- Accounting...
  - ◆ Translate Pricing/Metering into Logging and Authz policy rules and processing (?)



# Distributed Logging/Metering





# Distributed Logging/Metering

- Metering information distributed
  - ◆ Resource usage in different admin domains
- VO Accounting a distributed “challenge”
  - ◆ Need selective access to logs
- Need for sophisticated authz policies
  - ◆ Both to express & to enforce



# Accounting Language Issues

- Pricing/Metering/Accounting “Language”
  - ◆ Own vocabulary and semantics (ontology)
- Many other “languages”
  - ◆ Agreement/Authz/JobSubmission/Scheduling...
- Need to “merge” & “match”
  - ◆ Pricing&metering “talks about” Jobs, operations, roles, etc.
  - ◆ Leverage authz policy language for enforcement
- “Mismatch” yields errors
  - ◆ Accountants hate errors ;-)
- **Need common language base**
  - ◆ Common ontology-base



# Grid Accounting: Summary

- Grid Accounting requirements are “complex”
  - ◆ Dynamic VO context
  - ◆ Enforcement policy derived from Agreement
  - ◆ Distributed setting
  - ◆ It’s all about Policy, policy, policy, policy
  
- Need higher level “Accounting Architecture” Effort
  - ◆ Too many interactions
    - Too many questions
  - ◆ Leverage ongoing efforts
    - GGF groups RUS/UR/GESA/OGSA-WGs, IETF’s AAA
    - SGAS and DGAS Svcs at NorduGrid, SweGrid and EGEE