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GRIA

# Experiences with GRIA

## Industrial Applications on a Web Service Grid

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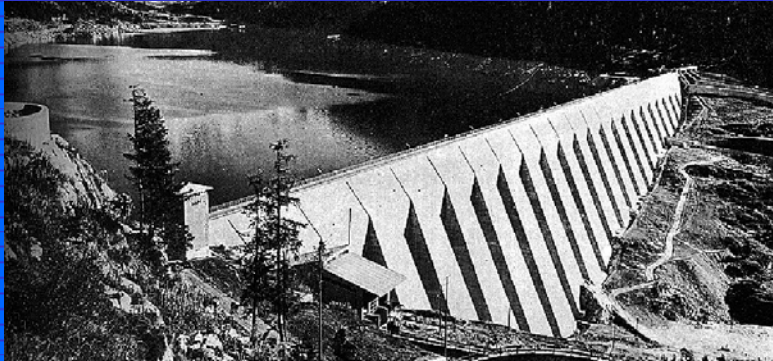
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## Overview

- Project goals and approach
- GRIA software
- Observations
  - on Virtual Organisations
  - on Grid architecture
- Future work

## GRIA applications

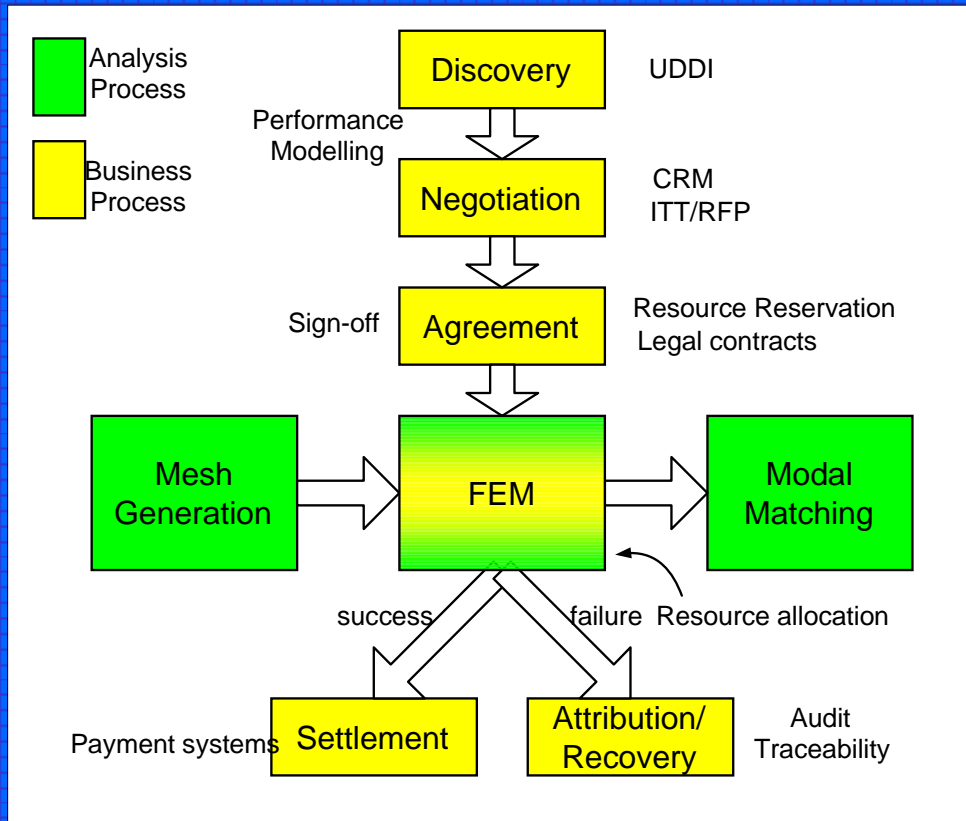


- Structural Identification
  - ENEL case study
- Structural analysis, e.g.
  - finite elements
  - model updating
- Out-sourcing and in-sourcing scenarios

- Virtual Digital Studio
  - KINO case study
- Post-production tasks
  - scene rendering
  - image enhancement
- Out-sourcing and collaborative scenarios



## A Grid for Business



- For each computation
  - find resources
  - negotiate access
  - agree service levels
  - perform service
  - determine outcome
  - bill the customer

## Objective: A Grid for Business

- Industrial grid
  - computational workflow
  - business processes
- Supporting business process which:
  - allows Grid service consumers to negotiate terms of access
  - allows Grid service providers to manage resources
  - provides well-defined quality of service
  - balances risks and rewards for both sides
- A market, not a commons



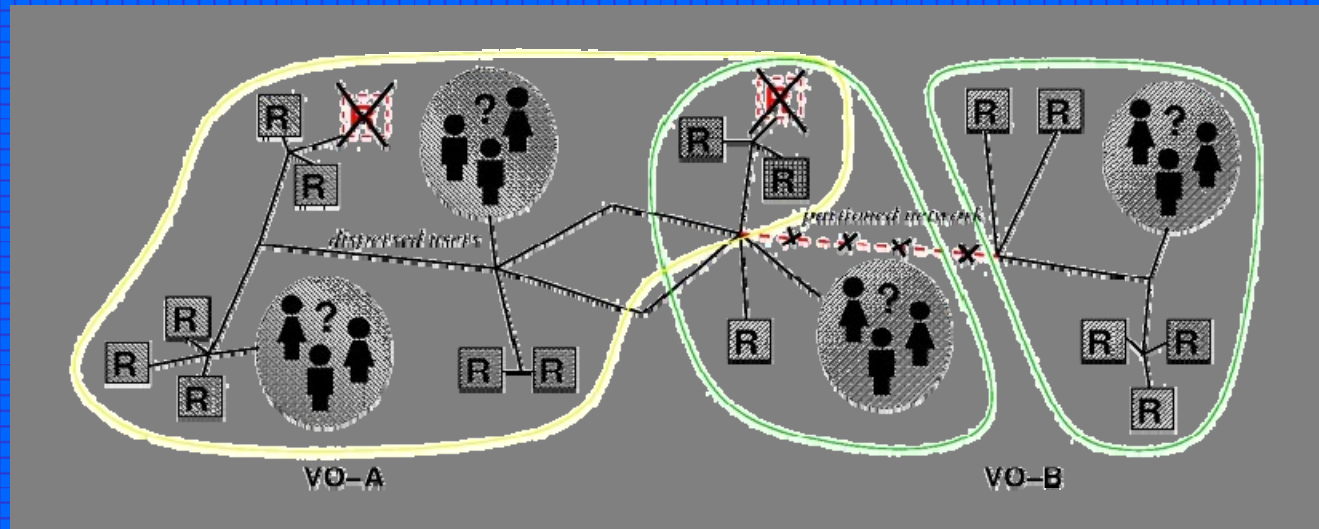
## Planned Approach

- Build on an existing open source Grid
  - project proposal suggested this would be Globus GT2
- Add business models and processes
  - supported by performance (QoS) estimation
- Address interoperability issues
  - through porting of the infrastructure (if necessary)
  - through cross-platform standardisation
- Evaluate using two different applications
- Disseminate to encourage take-up

# Open Grid Services Architecture

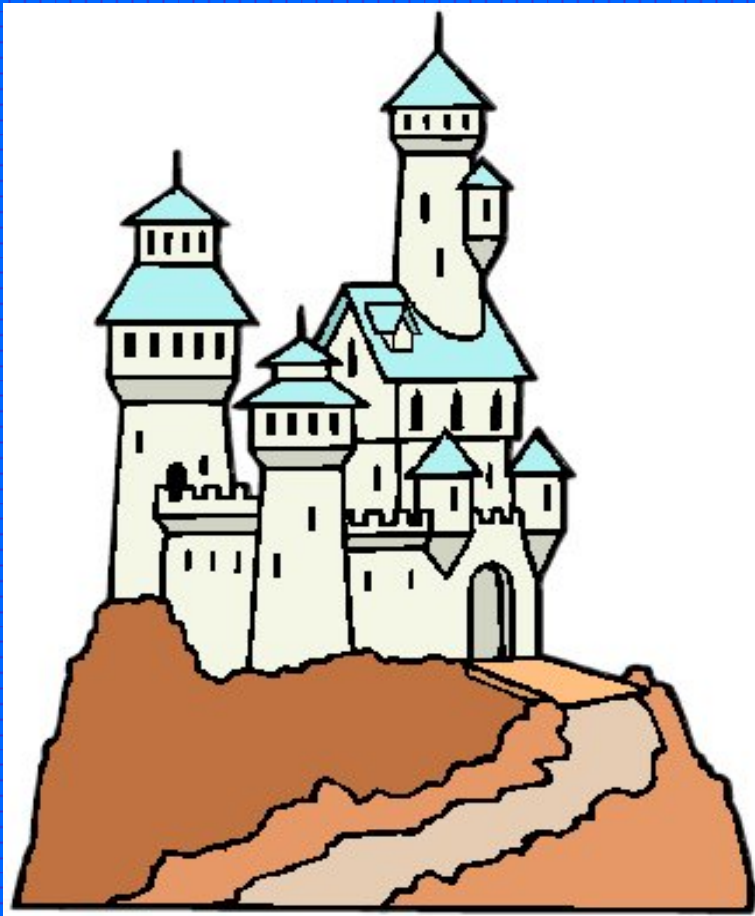
# GRIA

- ...a flexible, secure, coordinated resource-sharing among dynamic collections of individuals, institutions, and resources...
- ...the sharing and coordinated use of diverse resources in dynamic, distributed 'virtual organizations'...



# Industrial Security Expectations

# GRIA



- To match e-Commerce best practice in security
- Assume breaches will occur
  - don't rely on a single barrier
- Need security in depth
  - perimeter defences
  - authentication, access control
  - intrusion detection
  - watertight compartments
  - minimal privilege access
- But the Grid didn't provide this...
  - proxy holders assumed trustworthy
  - shell "all or nothing" access rights

## Revised Approach

- Abandoned the plan to start from Globus
  - not sure OGSA would be right first time
  - not happy with Globus security models in this context
  - no time to wait for GT3 in any case
- Developed a Web Services infrastructure
  - using “conventional” security mechanisms
  - but with “ambitious” interoperability goals
- Track OGSA at GGF with a view to convergence
  - no expectations of short-term convergence with GT3
  - aim at longer-term “semantic grid” standards

## Early Lessons

- GRIA v0: proving the use of web services
  - home-brewed SOAP message transport and security
  - reserve a resource, submit a job
- GRIA v1: the first true business process
  - introduced business-to-business trade accounts
  - wizard-based GUI, inflexible for users
- GRIA v2: a programmable business grid
  - helper classes to manage business processes
  - dynamic process-based access control
- GRIA v3: introducing off-the-shelf AXIS components
  - SOAP with attachments, WS-Security
  - client-side portal

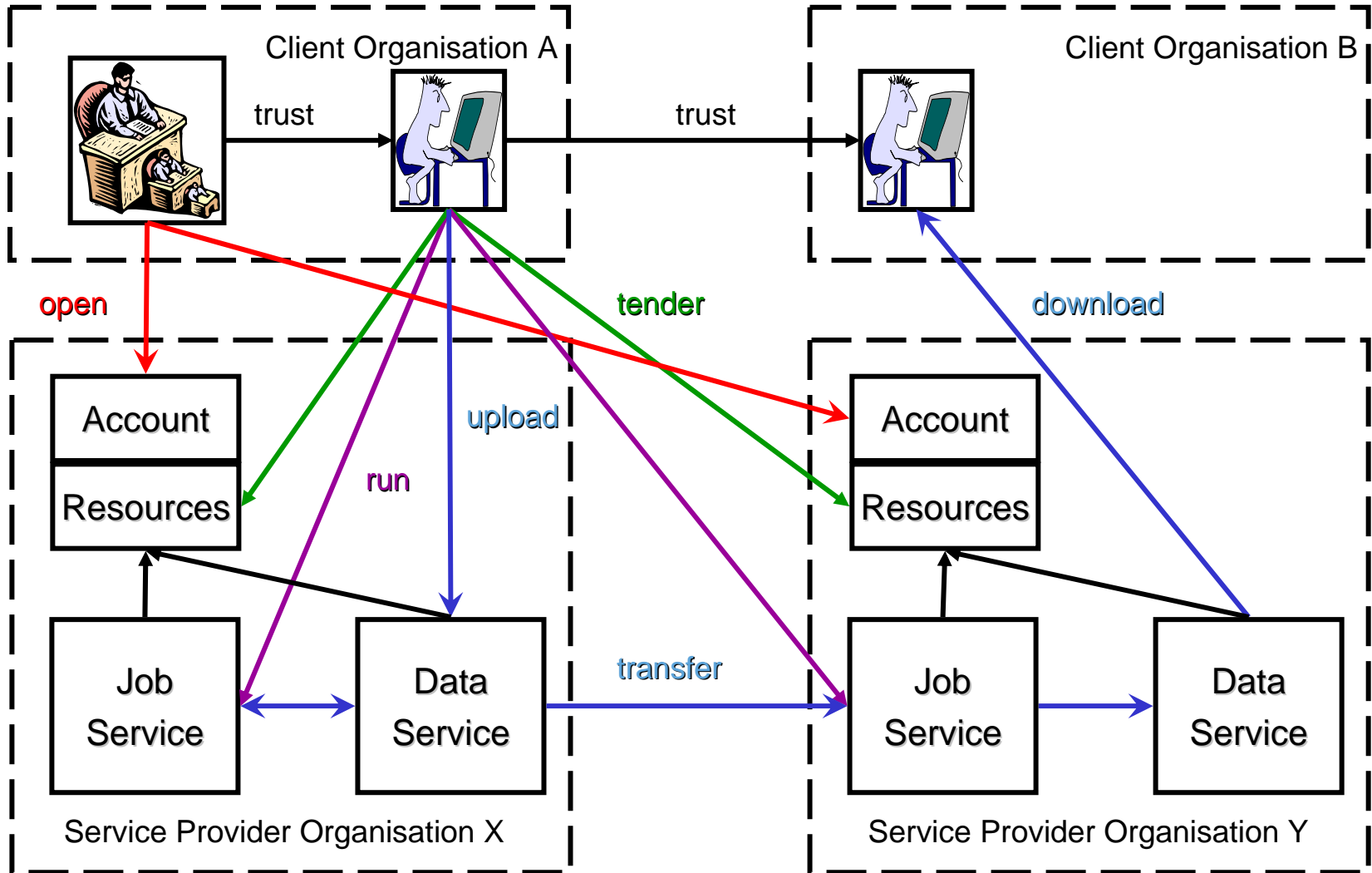
## Consumer-side Stakeholders

- Manager (the person who pays)
  - opens and manages access to trading accounts with service providers
  - enables access to trusted colleagues (usually subordinates)
- Application user (the person who runs the jobs)
  - allocates resources, charging them to the accounts set up by the manager
  - transfers and processes data
  - controls access to input and output data
- Application customer (the person who needs the results)
  - can access output directly if enabled by the application user



# GRIA Business Process

# GRIA

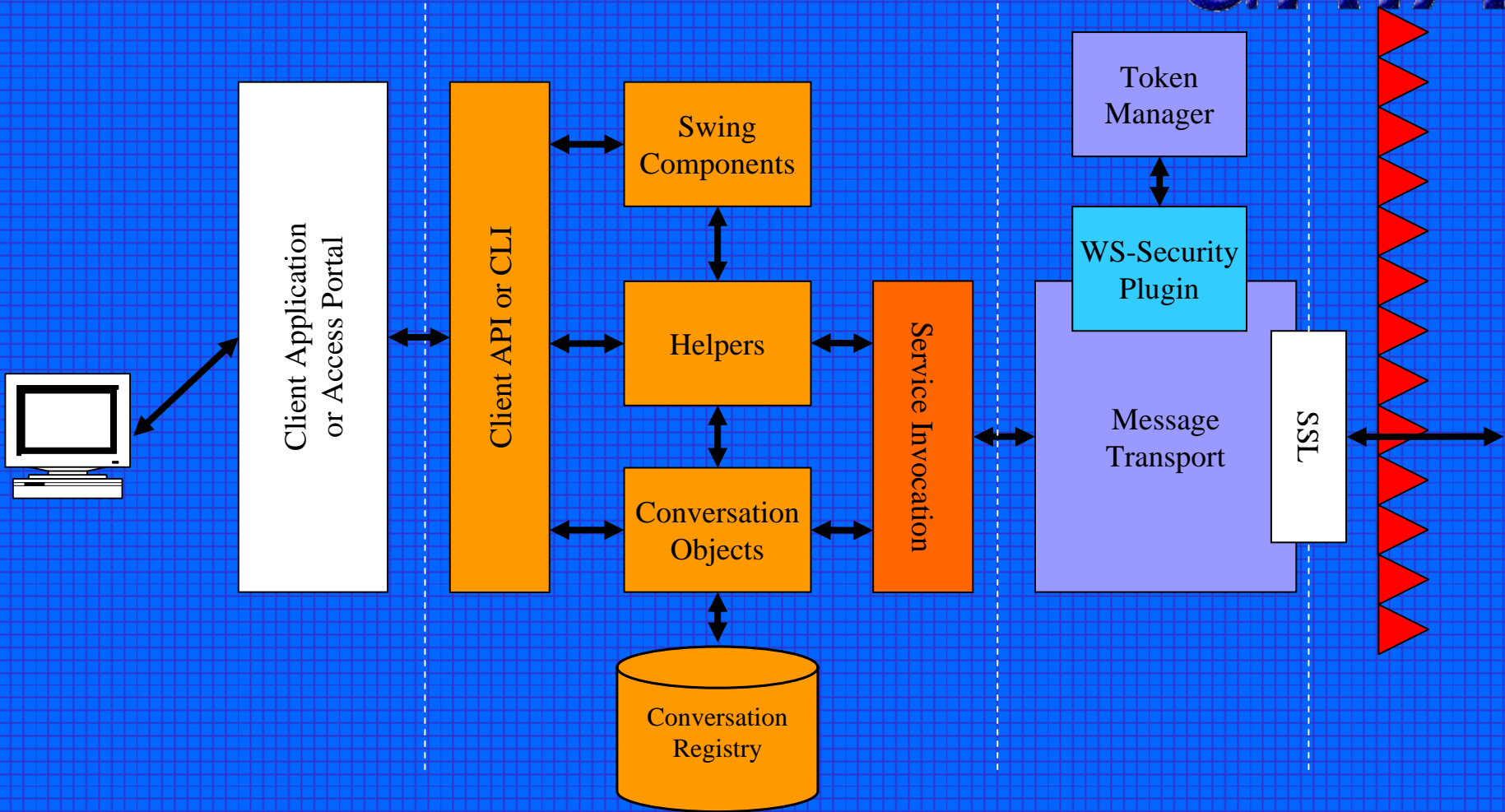


## Observations

- Service providers have 1-1 relationships with the Manager
  - trust the manager to pay for the services, and to control who can use them
- Service providers don't trust each other
  - application user can create applications that are distributed across multiple service providers
- This is a very general model of resource and consumer federation, but there is no central point of control
  - no bottlenecks or no single points of failure
  - no obvious point of attack for malicious users.
  - the limited trust / dependency between service providers, and the lack of centralised control should make GRIA very resilient against security breaches

# System Features

# GRIA



Client Application

Client Infrastructure

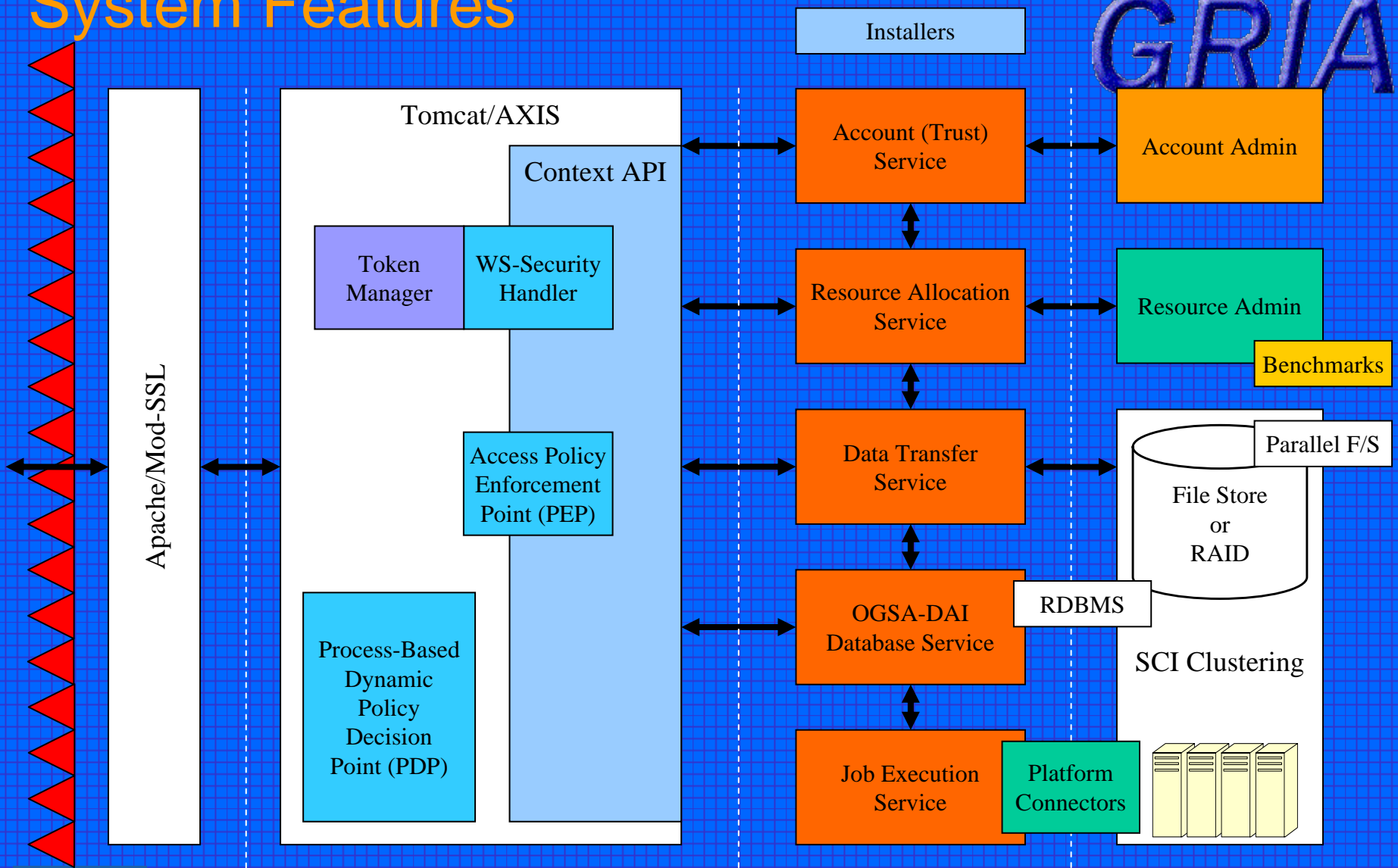
Client Security

Network Security



# System Features

# GRIA



Network Security

Service Infrastructure

Services

Resources



## GRIA v4.3 Features

- Easy-to-use yet powerful functionality
  - business-to-business accounting and QoS services
  - distributed file transfer, storage and processing
  - OGSA-DAI database services (new in GRIA v4.3)
  - Taverna workflow tools and service also available separately
- Off the shelf security components
  - transport and message level security
  - dynamic authorisation linked to business processes and trust
  - GRIA clients don't need to open firewalls or disable NAT
- Standards compliant
  - WS-I Basic Profile and WS-I Basic Security Profile



# GRIA Download and Support

# GRIA

The screenshot shows a Mozilla Firefox browser window displaying the GRIA website. The browser's address bar shows the URL <http://www.gria.org/>. The website header features the GRIA logo and the tagline "GRID Resources for Industrial Applications". A navigation menu includes links for Home, Download, Support, History, Reference, and Contact. The main content area is titled "A Grid For Today" and includes a sub-header "GRIA 4.2.0 is now available for download!". Below this, there are several sections: "What is GRIA?" (with links to System Requirements, Architectural Overview, and Future Development), "Security", "Trust", "Quality of Service", "Ease of use", "Availability", and "Support". The footer contains the copyright notice "© University of Southampton IT Innovation Centre, 2005" and a logo for "PRODUCTIONS S.A." in the bottom right corner. The browser's status bar at the bottom left shows "Done".

**GRIA** GRID Resources for Industrial Applications

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## A Grid For Today

**GRIA 4.2.0 is now available for download !**

GRIA is a Grid for today, aimed at business users (e.g. HPC providers, SME clients). It enables commercial use of the Grid in a secure, interoperable and flexible manner.

**Security**  
GRIA uses off-the-shelf Web Services technology and Public Key Infrastructure (PKI) security.

**Trust**  
GRIA supports well established B2B processes & trust models.

**Quality of Service**  
GRIA resource models allow service levels to be matched to clients' needs.

**Ease of use**  
GRIA is designed to support leading-edge and legacy application codes, and client-side applications can be easily written using the GRIA API.

**Availability**  
GRIA is free and open source.

**Support**  
GRIA is supported through an open source community and on a commercial basis.

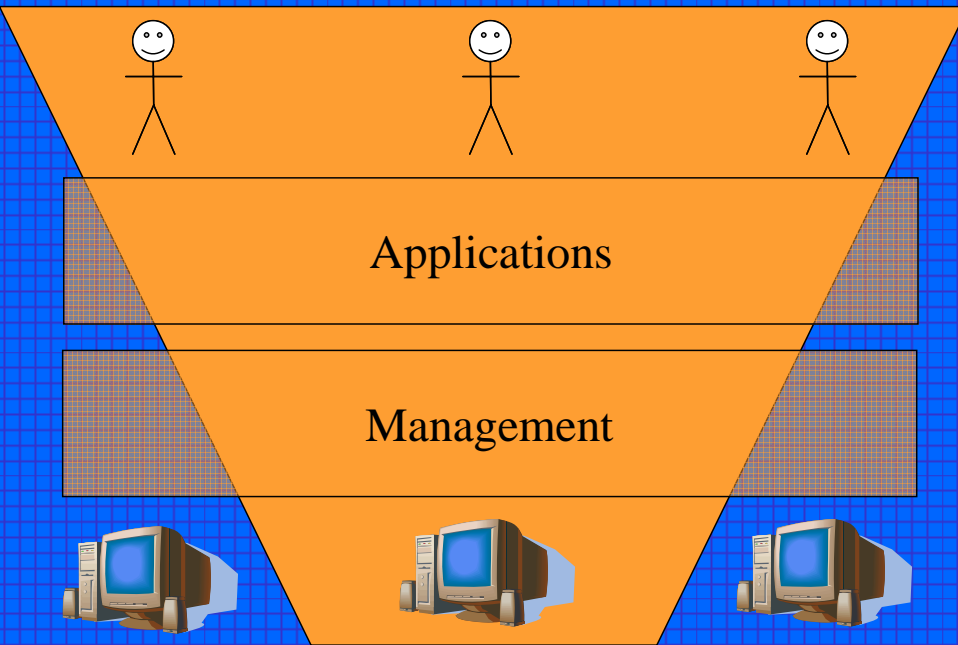
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# Virtual Organisations: “Big” VO

# GRIA

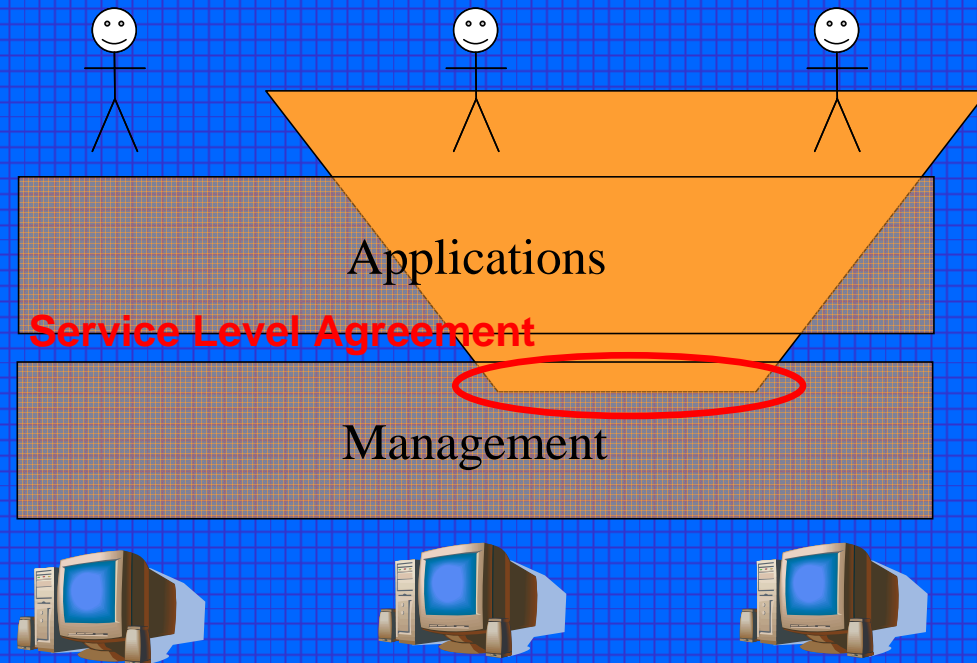


- Traditional VO
  - persistent
  - resourceful
  - manages federated resources
  - optimises to achieve shared goals
- Good for long-lived communities
  - e.g. academic collaborations
  - business cooperatives
- Not so good for market-based service provision
  - too trusting, too open

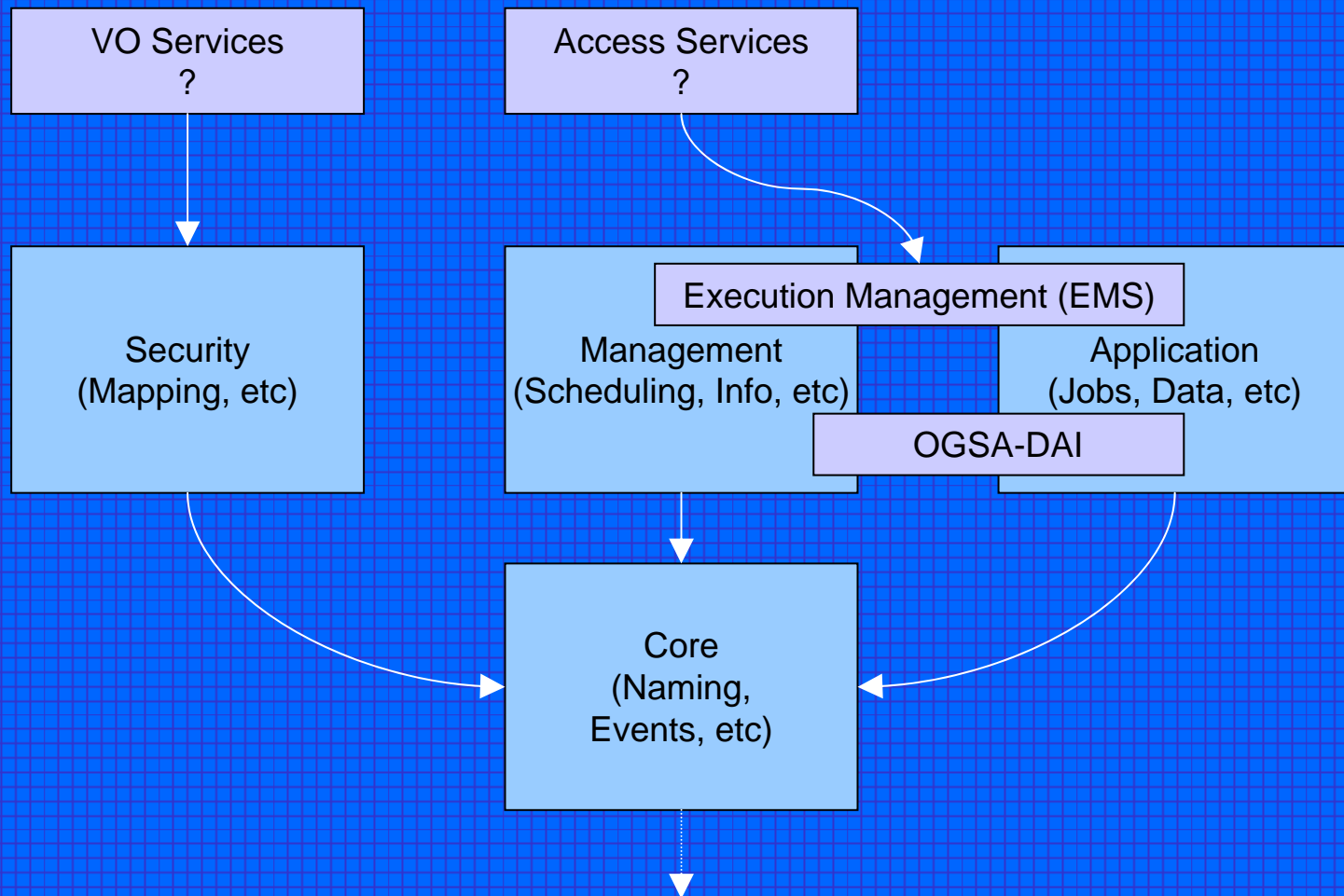
# Virtual Organisations: "Fast" VO

# GRIA

- GRIA federation
  - user-driven, transient
  - no prior infrastructure
  - resources managed by providers based on SLA
  - optimises provider-consumer value exchanges
- Service Level Agreements
  - regulate use of resources
  - replace VO-level controls
- Good for fast collaborations
  - market-based services
  - lightweight, short-lived project collaborations

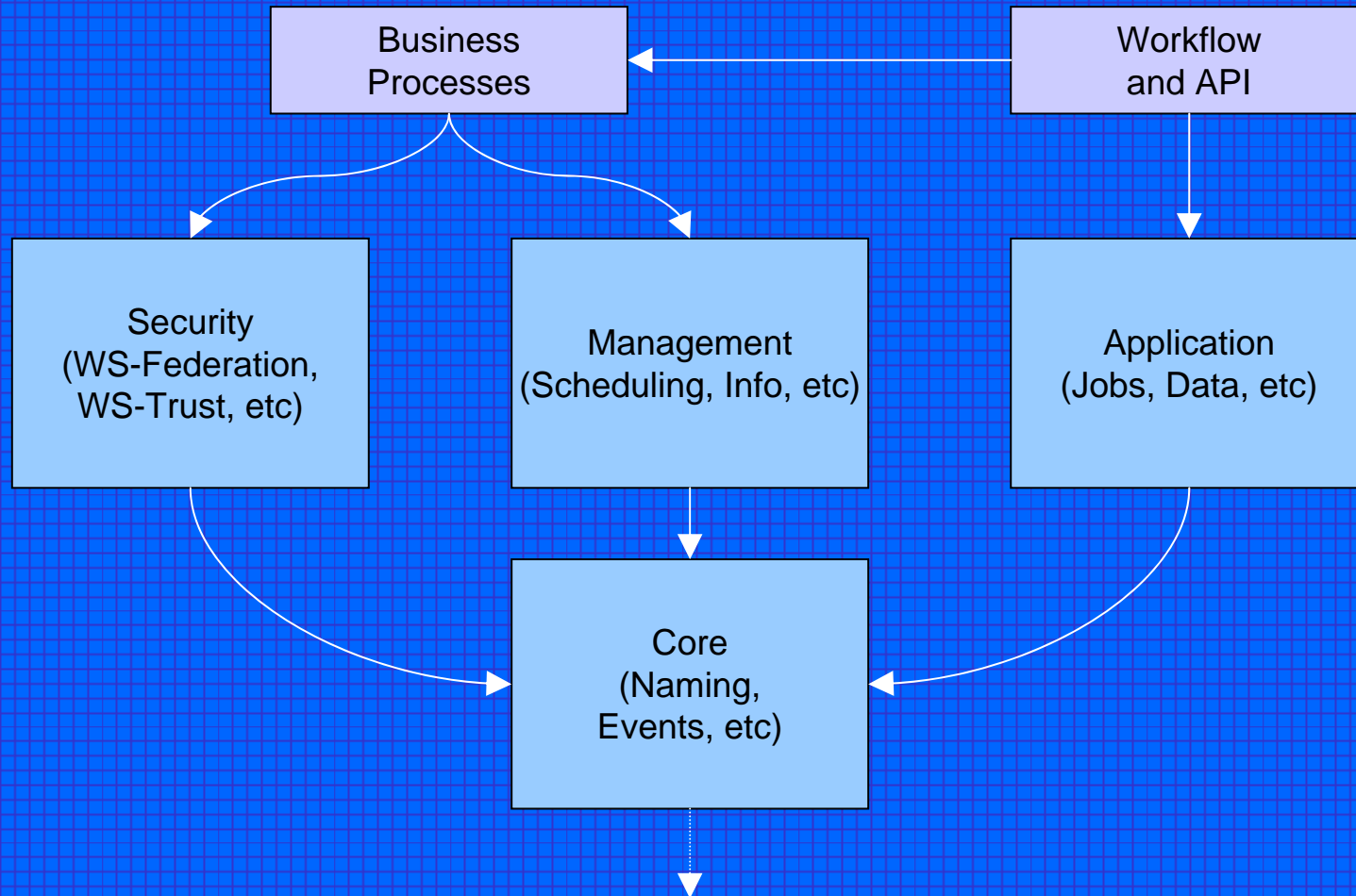


# Architectural Consequences: OGSA **GRIA**

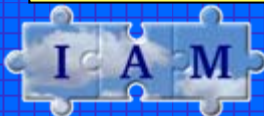


# Architectural Consequences: Alternatives to OGSA

# GRIA



Fabric: WS-Addressing, WSDL 1.0, SOAP/HTTPS, X.509, GFD.16/PKI, ...



## Reflections

- The GRIA-style “VO” doesn’t try to unite resource providers
  - we don’t think they would ever reveal this information to each other
- GRIA can unite resource consumers
  - once they have procured services, they can share them with each other
- Resource providers continue to manage their own resources, but in accordance with service level agreements with the initiating customers and other consumers
- The SLA provides a high-level abstraction for the resources provided, and the control consumers have over them



## Future Work

- GRIA and applications
  - used extensively in the EC SIMDAT project
    - aerospace, automotive, pharmaceuticals sectors
  - user applications are driving new functionality
    - service provider registries, new types of SLA
- GRIA and Grid architecture
  - new ideas being pursued in the EC NextGRID project
    - dynamic authorisation standards, semantic workflow, etc
    - role of SLAs in VO, and the relationship to WSRF and OGSA
- These developments will come together in new releases
  - GRIA v5.0 expected Q1 2006 (WSRF, dynamic RBAC, etc)
  - GRIA v6.0 late 2006 (adaptive workflow, SLA management, etc)

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