

## GridEcon Kick-off Meeting London, 11 July 2006



**(ARGUMENTation as a foundation for the semantic GRID)**

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European Commission

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Unit F2 – Grid Technologies



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# Overview



- **STREP - 36 months**
- **8 partners**

⇒ **5 academic**

**+**

**3 industrial**



⇒ **7 EU (UK, Italy, Greece, Spain) + 1 Asia (Thailand)**



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# Aims



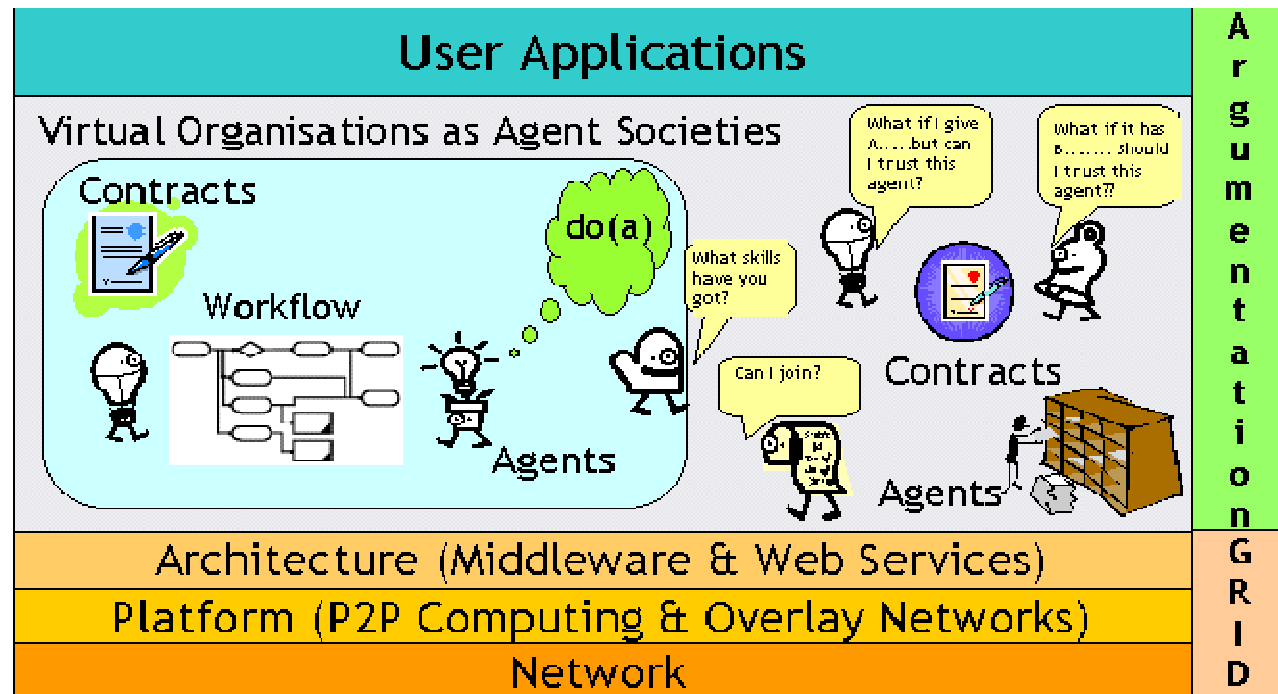
- **New model for programming the Grid**
  - ⇒ focus on the **semantic, knowledge-based** level to support the dynamic composition of ubiquitous resources/services;
  - ⇒ support providers/requestors' **preferences** and **decision making**;
  - ⇒ support dynamic **Virtual Organisation** formation
  - ⇒ support (semi-)autonomous dynamic **workflow** agreement
  - ⇒ enable **contract negotiation** processes;
  - ⇒ facilitate **dispute resolution** in contract violation;
  - ⇒ model **trust** and its role in VO operation;
  - ⇒ achieve **social equity** within VOs.



# Goals



- ⇒ Develop *argumentative agents* for the GRID, performing rational decision-making agents within VOs.
- ⇒ Incorporate argumentative agents into *service-centric architecture*.
- ⇒ Develop underlying platform using *P2P computing and overlay networks*.
- ⇒ Validate ARGUGRID by way of *e-business industrial application scenarios*.



# Argumentation for the grid



- **Argumentation (from AI) : logic-based process for the interaction of arguments for/ against decisions**
- **Argumentation to support:**
  - ⇒ **the reasoning of agents over resources/ services:**
    - ⇒ Objective/Goal Oriented service description
    - ⇒ Capability/preference specification
  - ⇒ **the inter-agent negotiation process:**
    - ⇒ Conflict resolution/Convincing
    - ⇒ Preference and benefit analysis (social welfare)
    - ⇒ Collaborative decision making
  - ⇒ **the dynamics of VOs:**
    - ⇒ the formation phases in the life of a VO,
    - ⇒ the definition of workflows and contracts in VOs,
    - ⇒ the resolution of disputes amongst agents and VOs
    - ⇒ the identification of trust level of agents and VOs.



# Workpackages



## Argumentative agents

preferences/utilities, decision-making, communication strategies/policies

## Virtual Organisations

workflows, contracts, trust, social welfare

## Semantics service composition environment

## Platform

p2p, overlay networks, GRIA

## E-Business scenarios and applications



# Technologies



- **Semantic service composition environment**

- ⇒ relate resources, semantic web-services, workflows, contracts, and agents.

- **Grid platform**

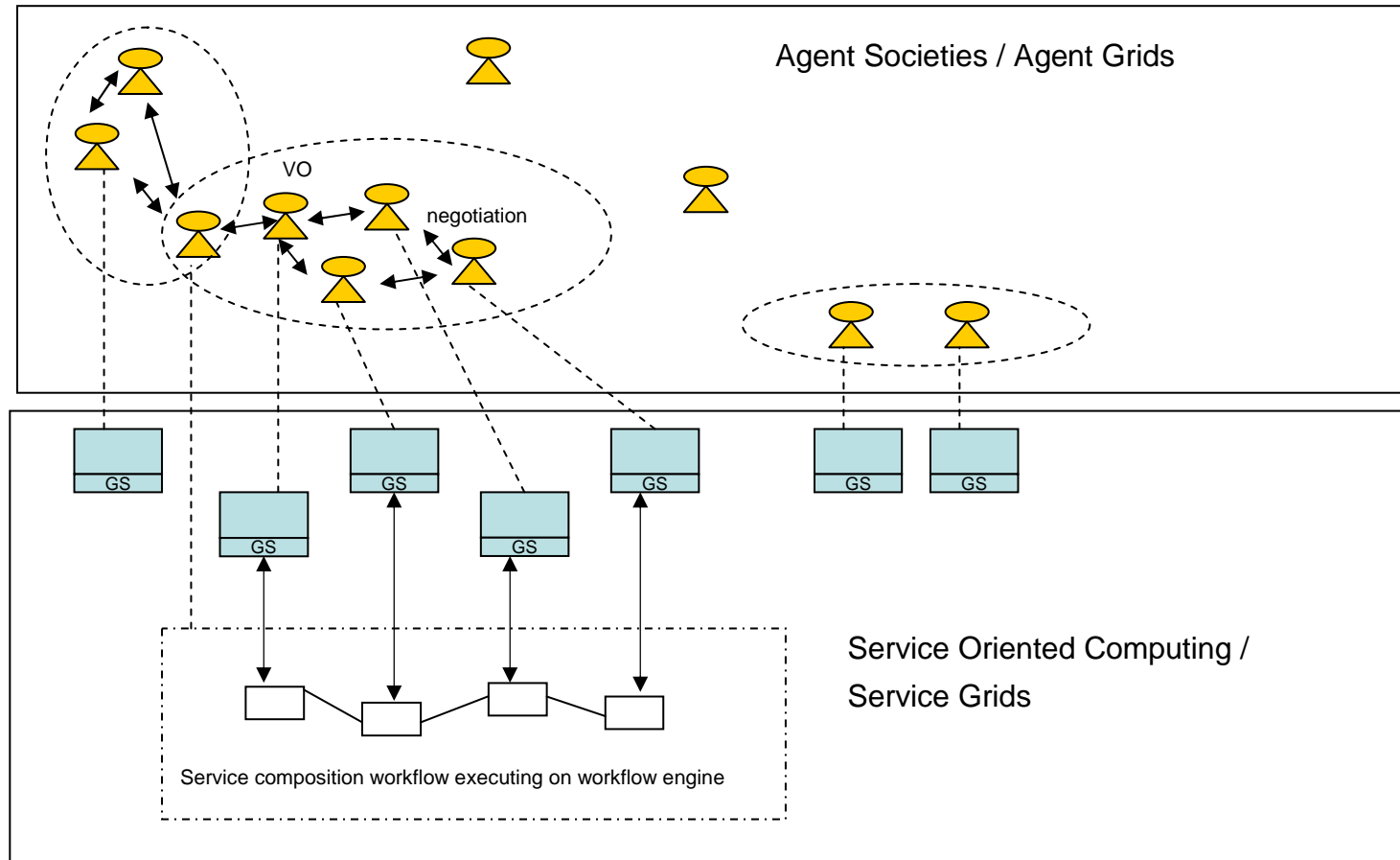
- ⇒ combine P2P computing and overlay networks;
- ⇒ build upon GRIA (SIMDAT)

- **Classes of practical applications**

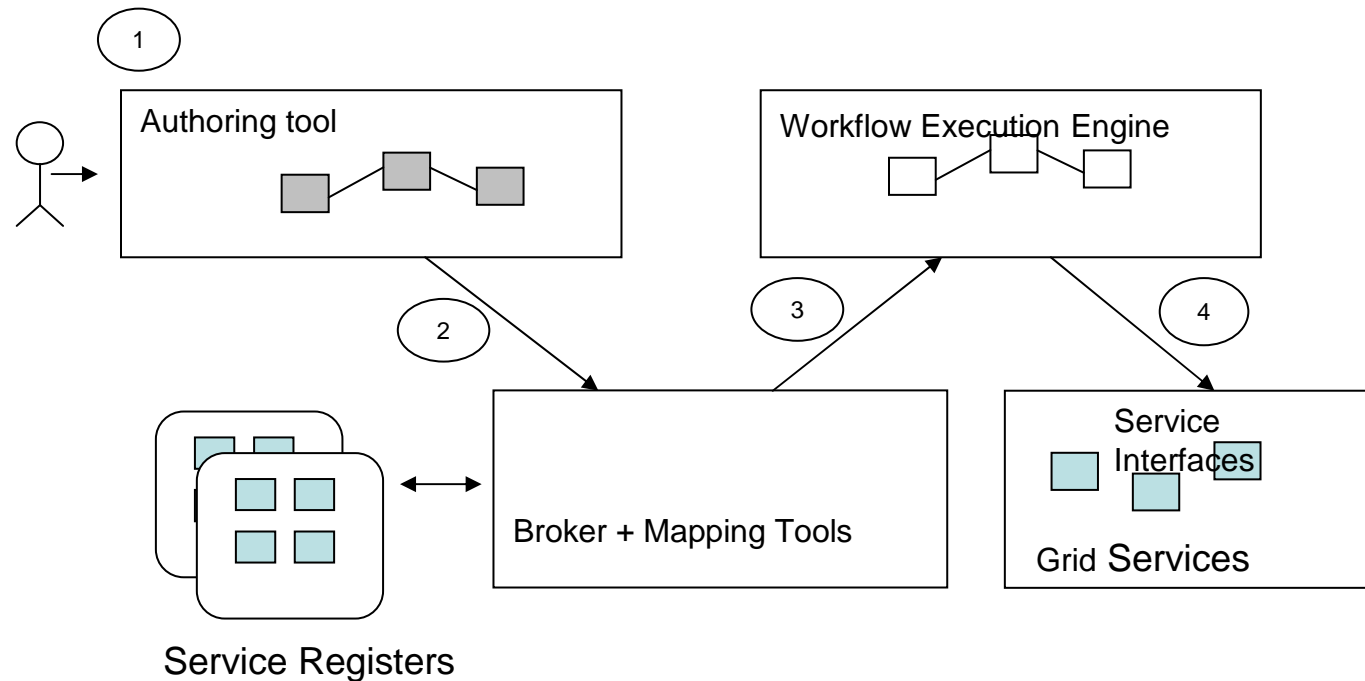
- ⇒ e-market places
- ⇒ e-business for earth observation
- ⇒ e-business migration (to some extent)



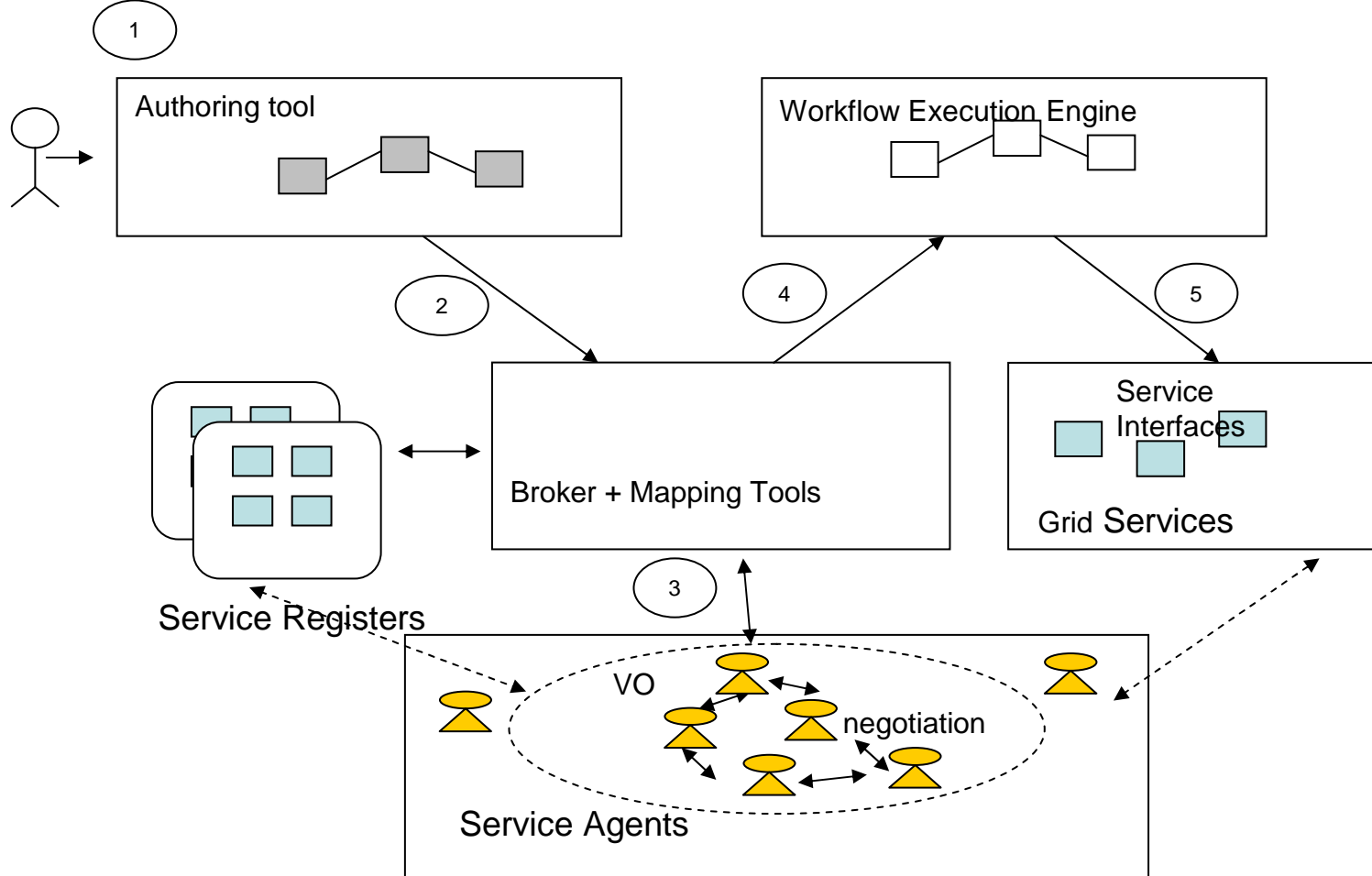
# Semantic service composition environment



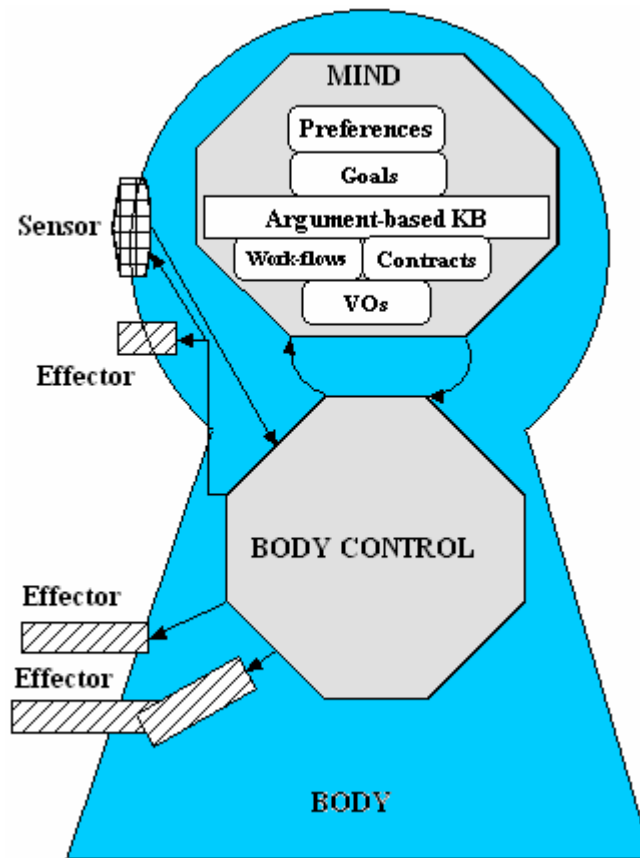
# Mapping abstract workflows into concrete workflows: conventional view



# Mapping abstract workflows into concrete workflows: ARGUGRID view



# Agents



# Impact



- **Businesses:**
  - ⇒ Framework and models leading to sustained/ competitive business operations for all industries.
- **Technology/Software/Service Providers:**
  - ⇒ New infrastructure, software, models and standards to enable better service provision in a grid environment. The outputs of the project will be directly accessible to industrial players.
- **Academics:**
  - ⇒ New methods and models for grid-computing, workflows, argumentation, agents and multi-agent systems, virtual organisations, contract negotiation, trust



# Key technology advancements



- **Grid-based agents**
  - ⇒ formalism for beliefs, goals/objectives, plans, utilities/benefits, and preferences;
  - ⇒ automating internal agent reasoning;
  - ⇒ contract-based interaction and negotiation.
- **Virtual Organisations and Workflows**
  - ⇒ identify needs and formation phases;
  - ⇒ define workflows and contracts for dynamic service composition;
  - ⇒ model dispute resolution & disagreements for contracts.
  - ⇒ interpret VOs as agent societies
- **Grid Architecture**
  - ⇒ rely upon standard Grid middleware based on web-services;
  - ⇒ support the creation and dynamic evolution of VOs;
  - ⇒ relate resources, semantic web-services, workflows, contracts, and agents.
- **Grid platform**
  - ⇒ combine P2P computing and overlay networks;
  - ⇒ focus on incremental deployment;
  - ⇒ provide adaptability and customisation;
  - ⇒ enable robustness built upon standards.
- **Classes of practical applications**



# Standardisation



- **Approach:**

⇒ **Regular tracking of standardisation bodies relevant to the project activities:**

- FIPA (Agents),
- OASIS (e-business),
- WfMC (Workflows)
- W3C (Semantic web)
- INSPIRE (Earth Observation)

- **Use and provide case studies for existing standards**



# Scenario: earth observation



⇒ **Security, Health and Meteorological services provided by GMV to benefit from encapsulation within the e-business scenario:**

1. Different steps to provide the services are represented by workflows
2. Data accessed/requested from various data repositories/providers (over the grid - using web services)



# Scenario: e-market places (beyond e-bay)



- ⇒ as the number of potential players in the market grows, we have a complex distributed computing problem involving a large amount of data and that is compute intensive.
- ⇒ Extensive negotiation is required
- ⇒ Some of the decisions may also require access to real-time data (currency exchange rates, up-to-date monitoring information, etc).



# Scenario: e- business migration



- ⇒ the users need a continuous access to the data on industrial estates, cities, districts, other companies etc
- ⇒ services are needed under request
- ⇒ real time is required, as information and requirements can become out of date quickly
- ⇒ accurate data delivery is important
- ⇒ new data sources and processes need to be included dynamically
- ⇒ the solution should be robust to failures
- ⇒ agents require grid computing since the computations required are both data and compute intensive

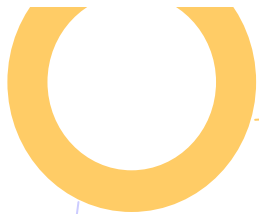


# Collaboration



- **Task CT1: technical concertation (old list)**
  - ⇒ **TG1: Grid architecture**
  - ⇒ **TG2: Ontologies**
  - ⇒ **TG3: Workflows and SLAs**
  - ⇒ **TG6: Trust and Security**
  - ⇒ **? Business models**
  - ⇒ **? Virtual organisations**
- **Task CT2: joint fora**
- **Task CT3: coordination of standardisation**
- **Task CT4: inventory**





[www.argugrid.eu](http://www.argugrid.eu)

**Questions?**



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