



GridEcon: Business Models for the Grid

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GridEcon: Project Facts

- ❑ Title is **Grid Economics and Business Models**
- ❑ EC funded project
 - ❑ **Addressed objective** “Advanced Grid Technologies, Systems, and Services” within the EU Sixth Framework Program, Priority IST
 - ❑ **Funding period** is July 2006 to December 2008
 - ❑ **Project size** is 3.89M Euro (EC funding is 2.35M Euro)
- ❑ **9 consortium partners**
 - ❑ **Coordinator:** Intl. University of Bruchsal
 - ❑ **Partners:** Athens University of Economics and Business, Imperial College London, the451Group, LogicaCMG, ATC, Ernest&Young, RealTimeEngineering, Gigaspaces



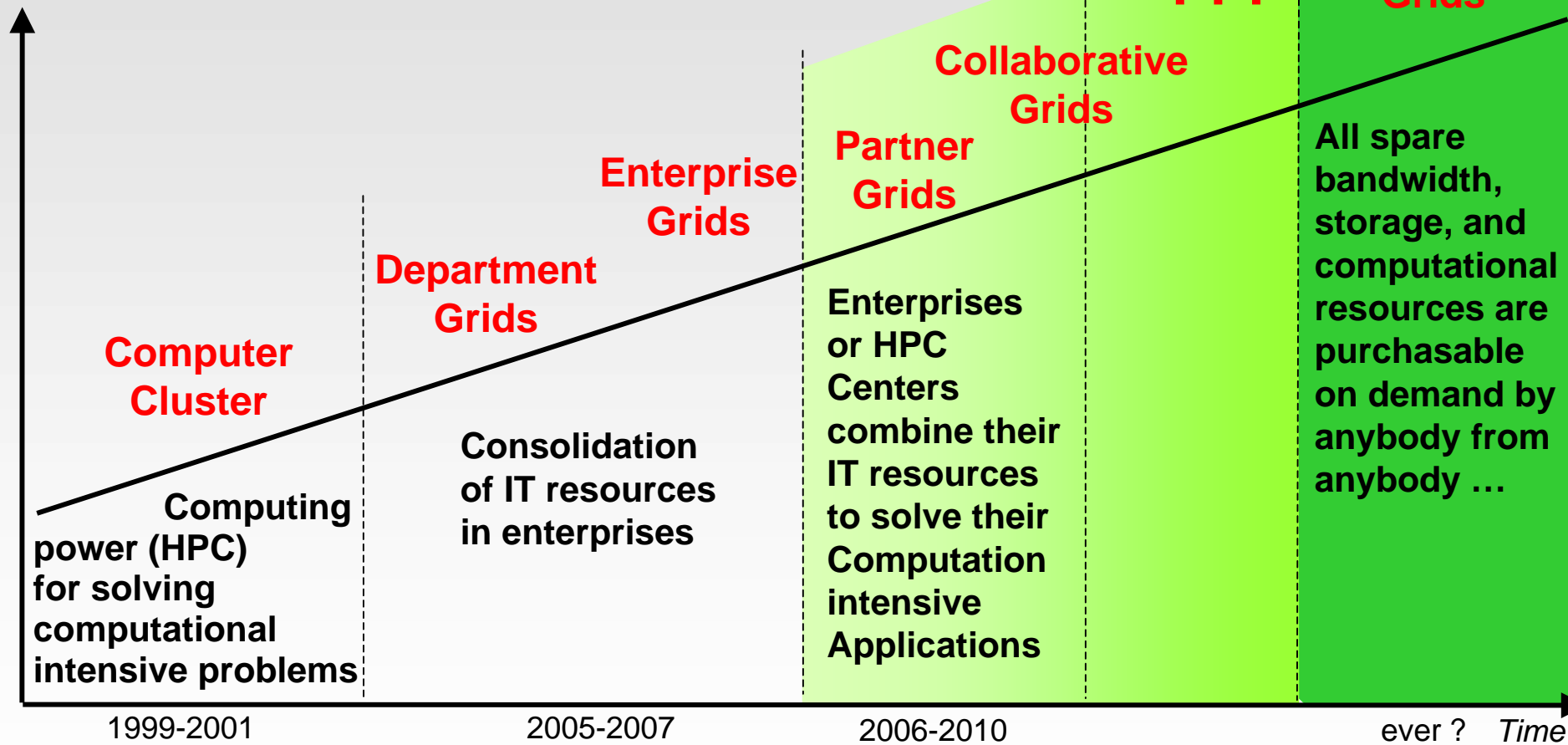
GridEcon: Project Scope

- The goal is to advance the functionality of existing Grid technology, so that
 - an **economics-aware operation of Grid applications and services becomes possible** (i.e. new Grid business models can be implemented)
 - **end-users can not only consume but also sell services (resources) on the Grid**, therefore, creating a new economy in which all end-users can actively participate (generate income)

Motivation: Closing the Gap to Open Grids



Openness of Grid



□ Classification of Grids by ownership, use, utility, kinds of resources (e.g. SW, HW) might help to define the ??? area



Motivation for a Project on Grid Economics and Business Models

- ❑ There are many **technical solutions** for Grid computing
 - ❑ Many open source middleware systems (Globus, glite (dgas), GRIA, Unicore, etc) have been developed
 - ❑ There are even a few commercial middleware implementations

- ❑ But, **only a few sustainable applications** of Grid technology exist. They are
 - ❑ In the area of **high-performance computing** and,
 - ❑ To a **limited extent, in the commercial environment**

- ❑ **What is the reason for this low take up?** Are there no other sustainable business models?



Motivation:

Sustainability of Grid Computing

□ Sustainability of Grid Computing is about

- Finding **business model** which guarantees RoI (Return on Investment) to recover at least the cost for this new infrastructure

□ To achieve sustainability in the Grid environment

- **Tools for users** (researchers, organizations, companies, general public) are needed **so that users can benefit** from the Grid
 - Benefit means that there is a return on a user's investment in Grid
 - Tools can be ontology definitions, data structure updates, a **dynamic scheduler, a risk broker, capacity planning, services markets**, etc



Incentives for Using the Grid: Addressed Features of the Grid

- ❑ **Cost reduction** through IT Outsourcing (e.g. Enterprise Grids, Department Grids)
 - ❑ Enterprises are using Grid technology to
 - ❑ **Interconnect** their IT resources
 - ❑ **Consolidate** their enterprise-wide IT resources
 - ❑ Savings are based on economies of scale

- ❑ **Capability to solve computationally intensive problems that cannot be solved without combining resources**
 - ❑ **Examples**: scientific computing, commercial calculations (Shortening time-to-market of products)
 - ❑ **Society benefits by getting**
 - ❑ New knowledge
 - ❑ Reputation
 - ❑ Technology leadership



Incentives for Using the Grid: Not Addressed Features of the Grid

- ❑ **Availability of on-demand computational power**
 - ❑ Speeds up research output and time-to-market of products
- ❑ **Low cost of ownership (no upfront investment)**
 - ❑ Small and medium-size enterprises have not to purchase high-end servers and software anymore (e.g. injection molding simulation)
 - ❑ General public can establish home enterprises
 - ❑ Any researcher can have access to high-performance computers
- ❑ **Simplicity of using resources (hardware and software)**
 - ❑ Availability of a **pool of applications** in the e-science or commercial work space
- ❑ **Pay-for-use / pay-as-you-go**
 - ❑ Grid computing could provide **small-medium-size enterprises, any researcher, or partner in a partnership** pay-for-use access to high-end servers and software



Incentives for Using the Grid:

Example: HPC Center Interconnect.

- ❑ Despite the interconnection of HPC centers, **not every researcher has access to the Grid**
 - ❑ A researcher in a poor state (poor country) cannot execute her application since she does not have access to a HPC environment
- ❑ **Conflicts in preferences between stakeholders cannot be resolved**
 - ❑ **Why** should state A (/ country A) allow a researcher of state B (/ country B) accessing its high-performance computer (which has been paid by tax payers of state A)?
 - ❑ **Will** the researcher of the local HPC center have higher priority over other researchers? (Who gets the resource if a supercomputer is overbooked?)
 - ❑ **How much** of the high-performance computing resources should be made available to the Grid?
- ❑ **Policies exist which try to address the issue of resource allocation but provide not economically efficient solution**



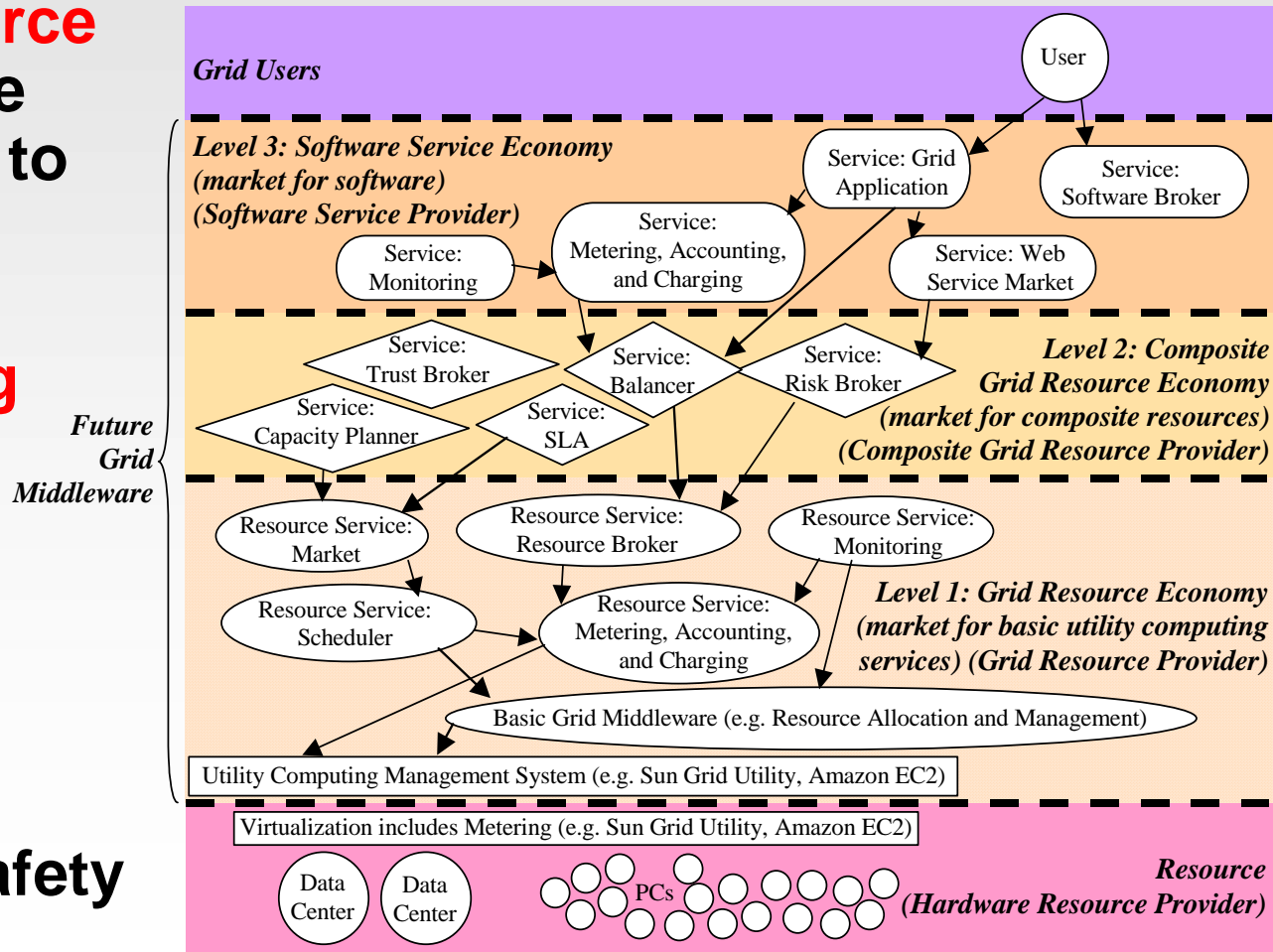
GridEcon: Research Plan

- ❑ **Consider different** (three) **Grid scenarios** in which preference conflicts exist
 - ❑ Scenario 1: **Interconnection of Grid systems**
 - ❑ Scenario 2: **Service-oriented architecture**
 - ❑ Scenario 3: **Software-as-a-service**
- ❑ **Identify** stakeholders and roles
- ❑ **Analyze** common issues in those scenario
- ❑ **Design** solutions based on economic models
- ❑ **Integrate** solutions (new services) into existing Grid middleware



GridEcon's Research Topics and Reference Architecture

- ❑ **Billing stack** for different kind of services has to be in place enabling **compensation of providers for resources** supplied
- ❑ **Fairness of resource allocation** (service markets) in order to reduce policy limitations
- ❑ **Capacity planning and decision support** through business intelligence tools
- ❑ **Risk analysis** of remote sites with respect to data safety





Conclusion

- If GridEcon will be successful, there will be **an environment to collaborate across individual organizational boundaries**
 - **reducing participation risk** by paying an appropriate price, and
 - **economically fair sharing** of costs and generated value



Add-On

- ❑ **4th International Workshop on Grid Economics and Business Models: **GECON2007****
 - ❑ Date: 28.August.2007
 - ❑ Location: Rennes, France
 - ❑ Co-Located with EUROPAR2007 and with the CoreGrid Symposium
 - ❑ Held before in Seoul (2004, 2005) and Singapore (2006)
 - ❑ http://it.i-u.de/schools/altmann/gecon/?page_id=2

- ❑ **Technical Working Group on “Grid Business Models and SLAs” in the EU has been established**
 - ❑ Activities: Coordination of work on economics



Thank You!