Grid-based Collaborative Product Design: The SIMDAT Grid Solution Portfolio

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IT Innovation Centre

Grids Mean Business: Collaboration Grids
OGF21, Manchester
Wednesday 9 May 2007

Contents

- Project Overview
- Industrial Test Cases
- Collaboration Patterns
- Grid Solution Portfolio
- Policy Analysis and Technology Gaps
- Conclusions

IST EU SIMDAT Project (Sep 2004 – Aug 2008)

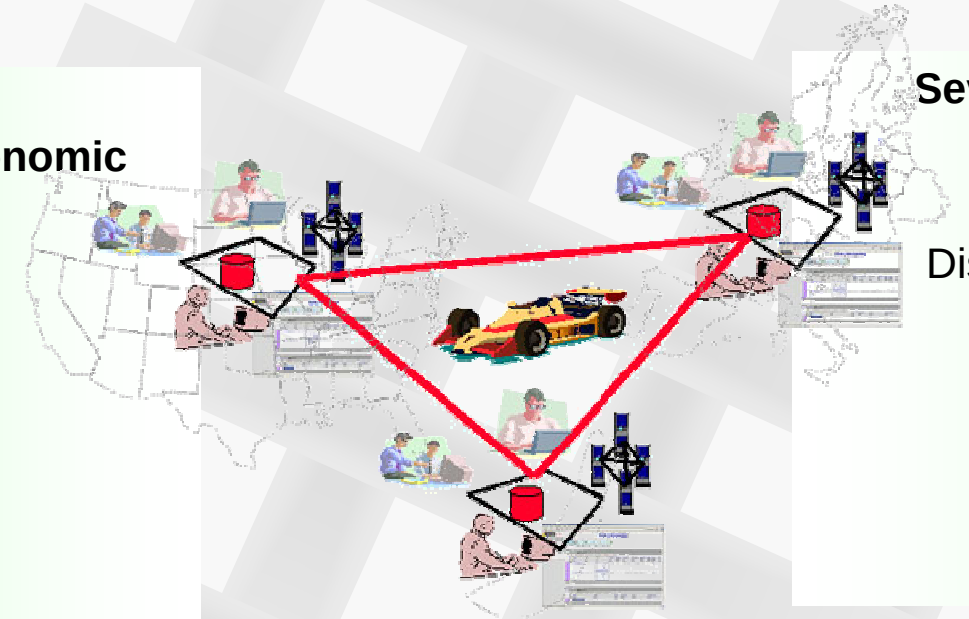
Four sectors of international economic importance:

Automotive

Pharmaceutical

Aerospace

Meteorology



Seven Grid-technology development areas:

Grid infrastructure

Distributed Data Access

VO Administration

Workflows

Ontologies

Analysis Services

Knowledge Services

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Who are the SIMDAT Partners?

Application Users

Capability Providers

Grid Technologists

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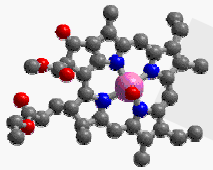
Demanding Application Drivers

- Integration of the product design process chain (CAE/CAD/CAT) including external engineering companies, developers and suppliers

- Multi-disciplinary collaborative configuration design of complex aerospace products



- Drug discovery environment managing the distribution of both public and commercial bioinformatics data and analysis services

V-GISC

- Virtual Global Information System Centre supporting the distribution and integration of large scale meteorology data providers

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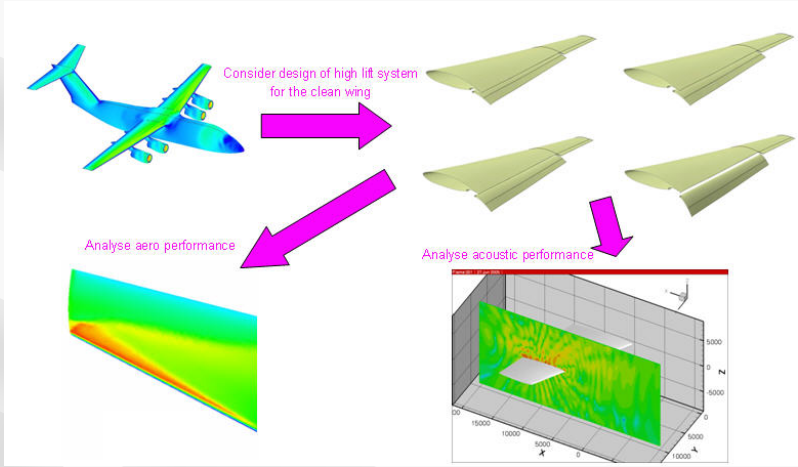
Collaborative Aerospace Design Testcase

- Multi-disciplinary inter-enterprise collaborative design of a low noise high lift system
- Based on a BAE Systems Regional Jet test case
- Engineering capabilities shared between organisations
- Distributed engineering workflows and data management over the Internet



EADS

BAE SYSTEMS

University of Southampton

MSC SOFTWARE SIMULATING REALITY

LMS ENGINEERING INNOVATION

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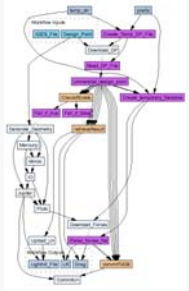
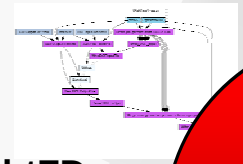
What has been achieved so far?



(Model Center, SunGridEngine, GRIA)

(Matlab, OGSA-DAI, Condor, GRIA)



(iSightFD, Torque, GRIA)

(Patran, GRIA)

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Automotive Distributed Product Development

PDM/CAD → Preprocessing → Solving → Postprocessing

distributed Data Bases

Information Management

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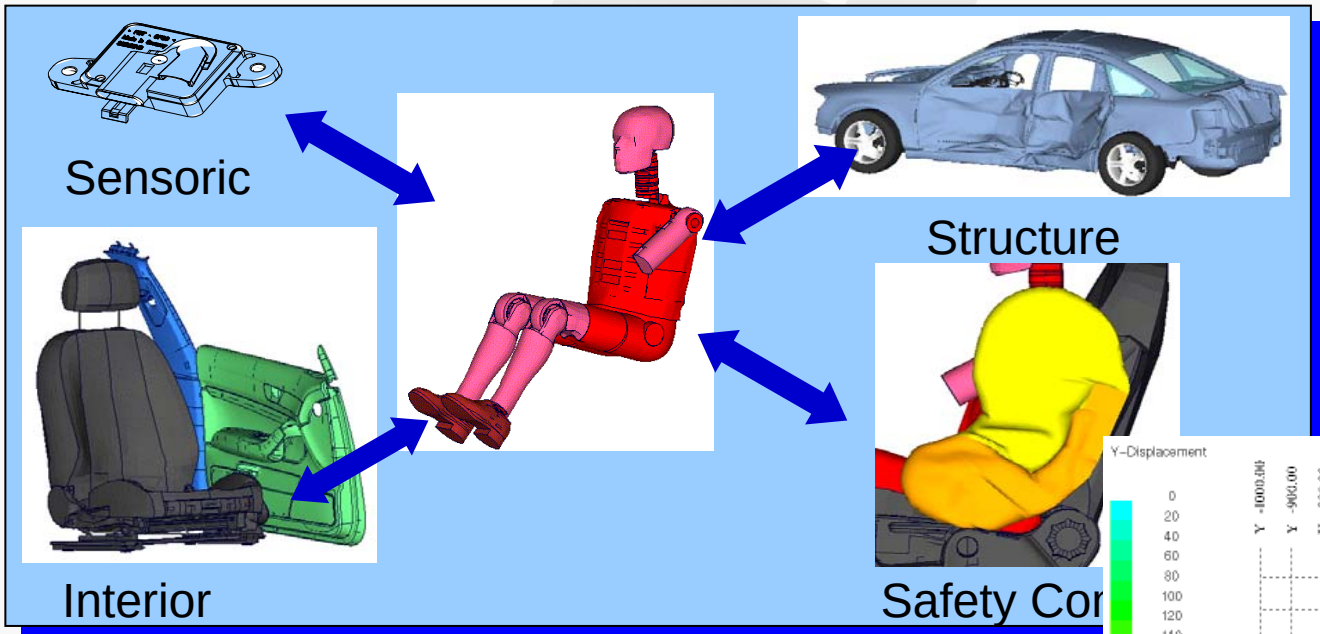
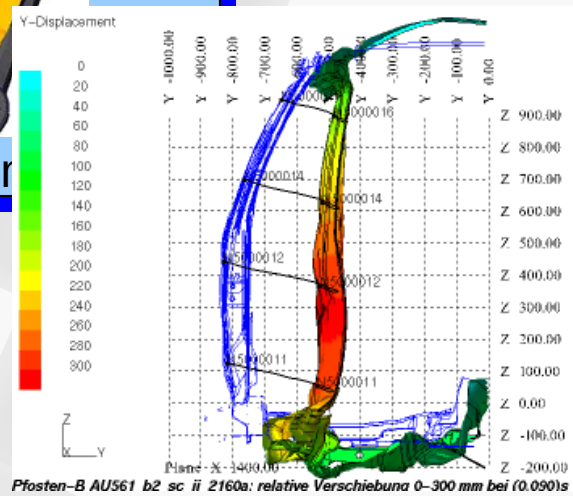
Different Disciplines in Product Development





Only the optimal interaction of all components leads to reduced velocities, if huge vehicles are impacting

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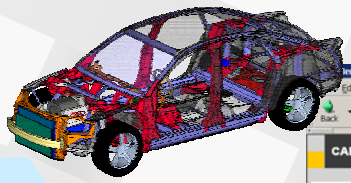
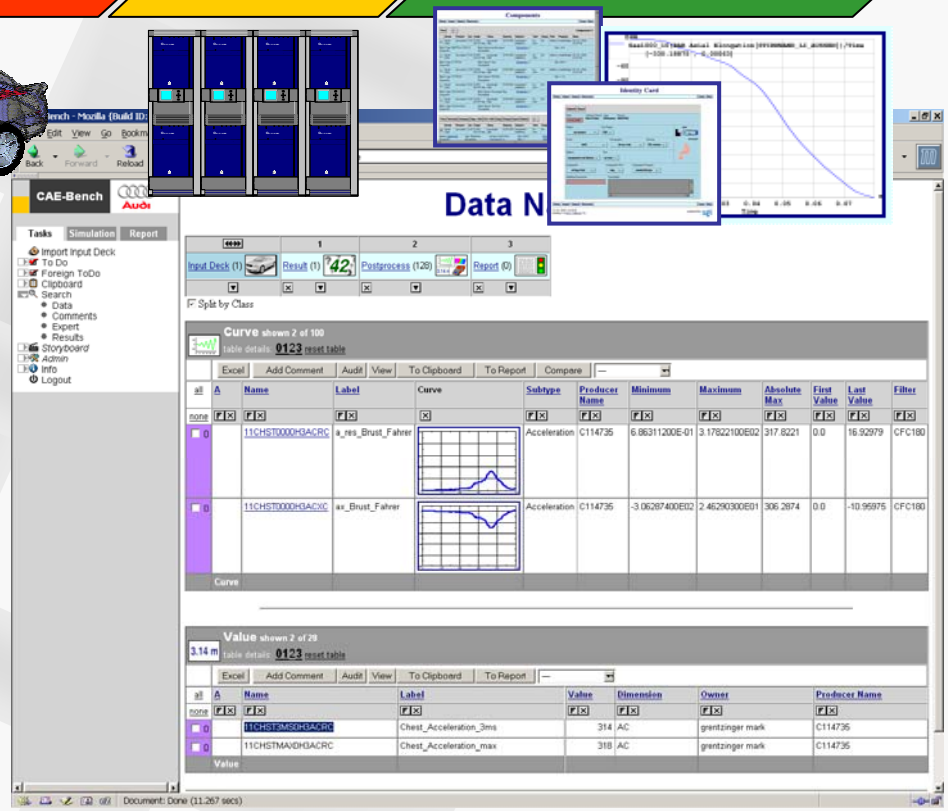
Problem Solving Environments

PDM/CAD → Preprocessing → Solving → Postprocessing





Architecture
- Fully Web-integrated
- Server based

Integration
- CAE/CAD/CAT Data
- Applications

Standardization
- Reporting
- Knowledge Base

Workflow
- Result Comparison
- Variant Computation

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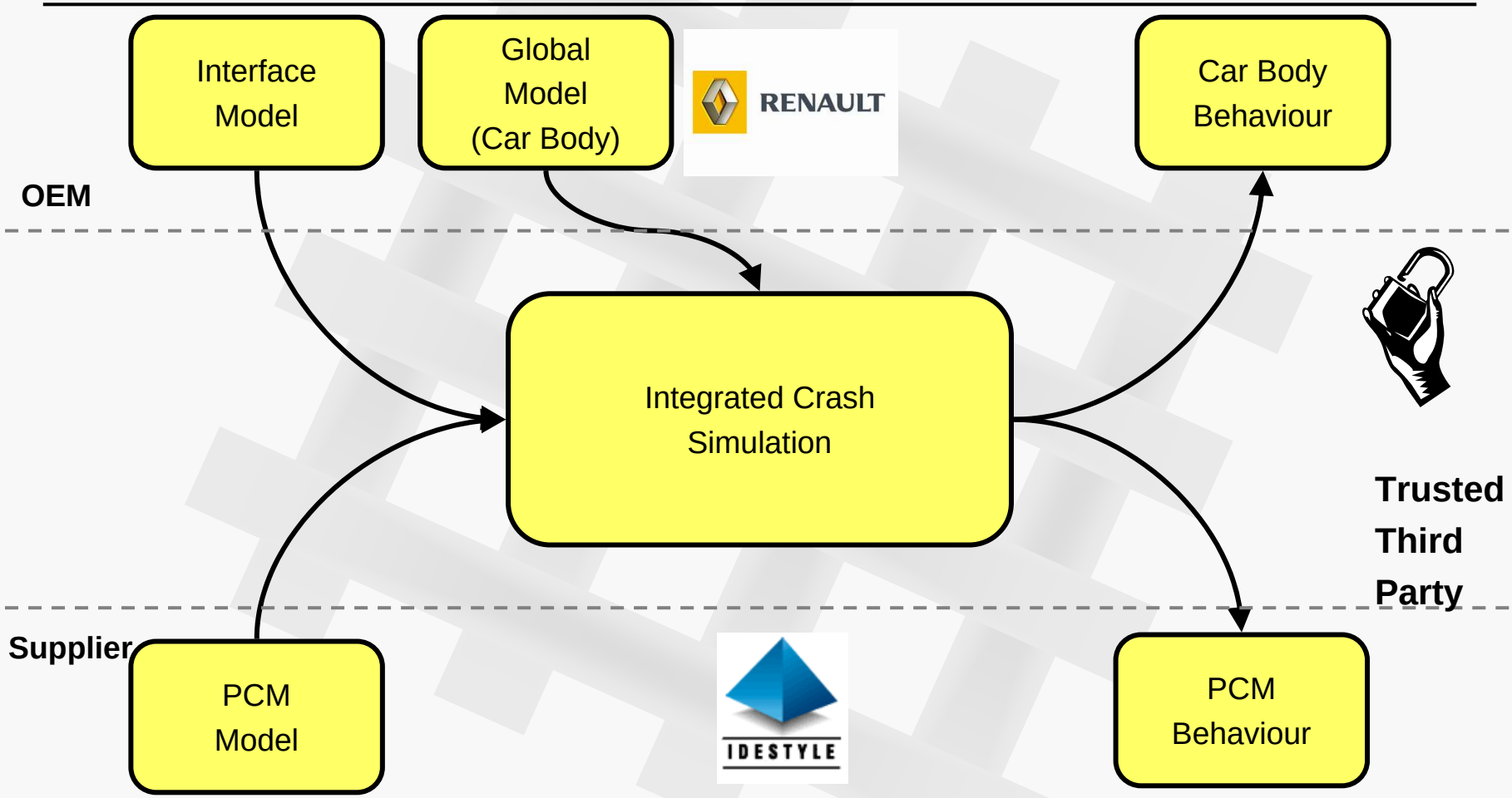
OEM/Supplier Integration (1 of 2)



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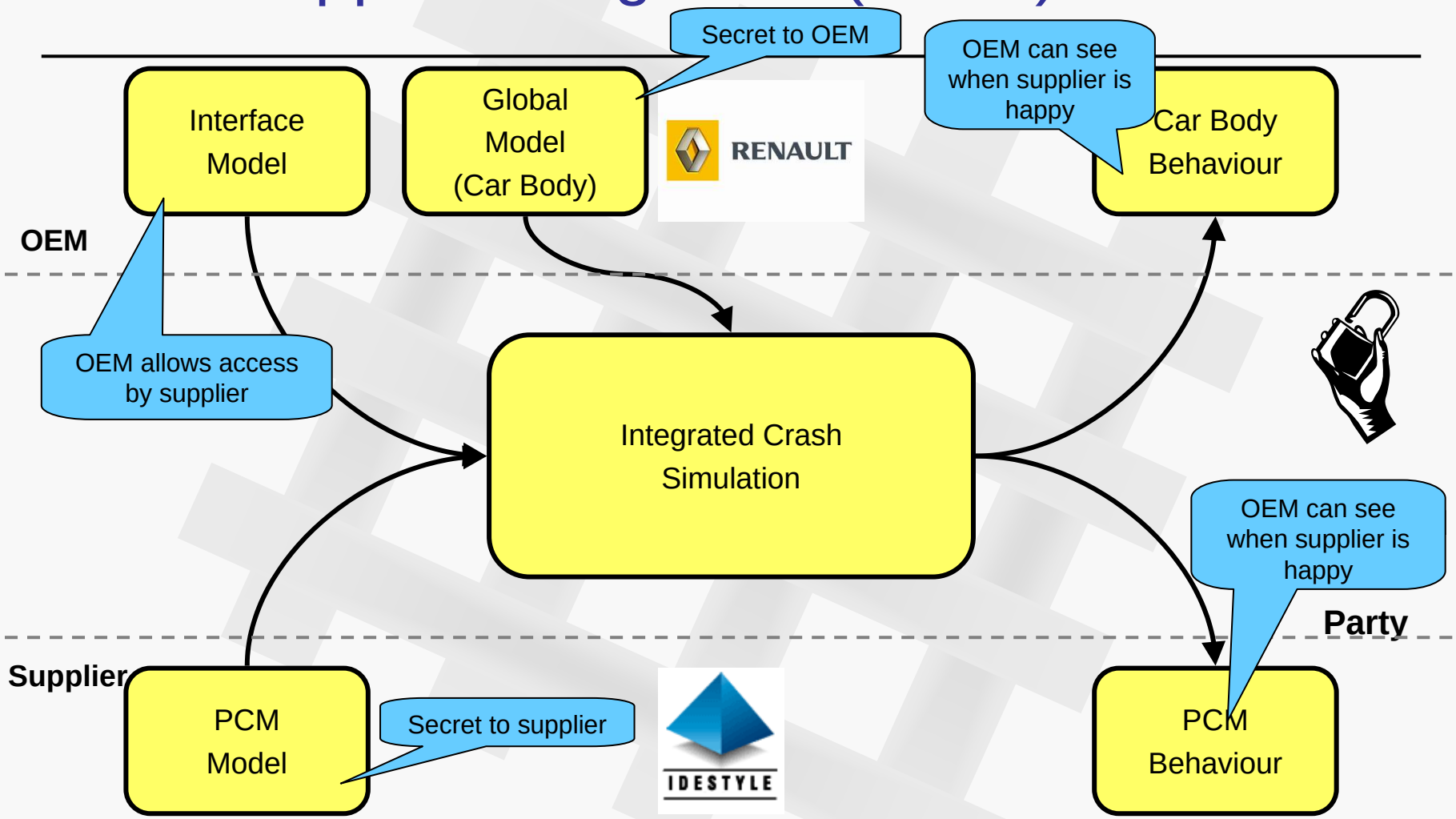
OEM/Supplier Integration (2 of 2)



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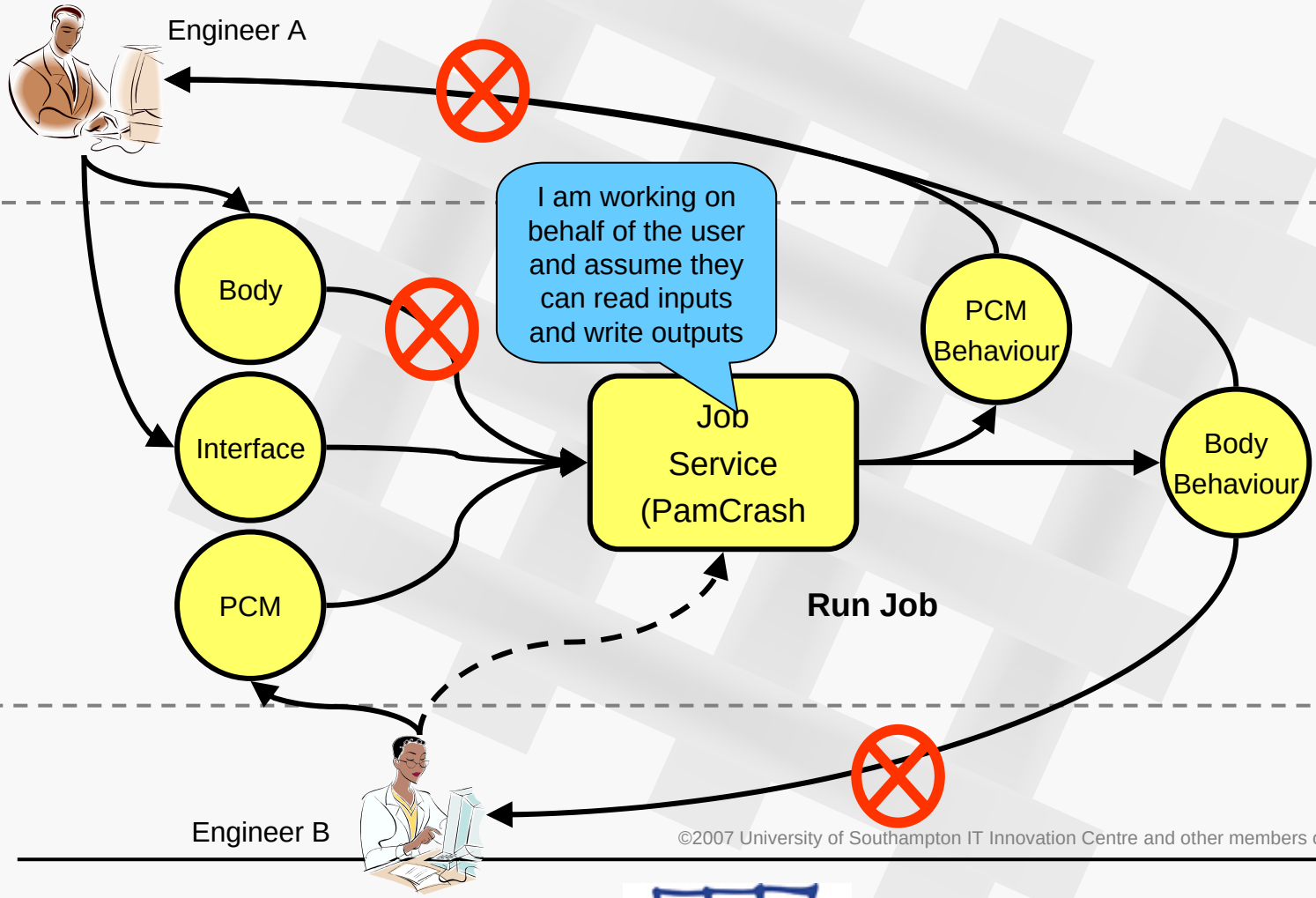
The Data Ownership Problem



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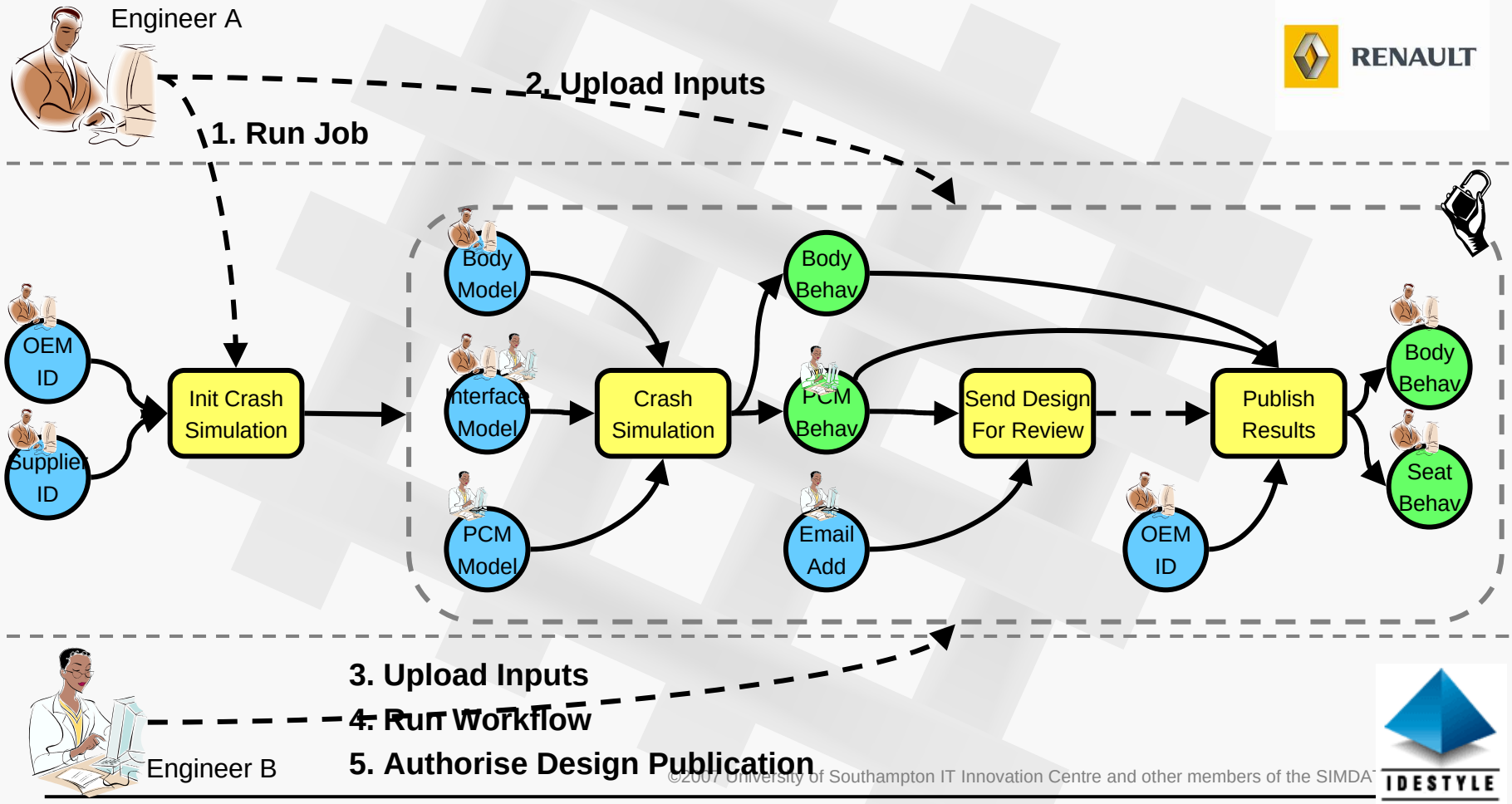
Multi-stakeholder Design Processes



IDESTYLE

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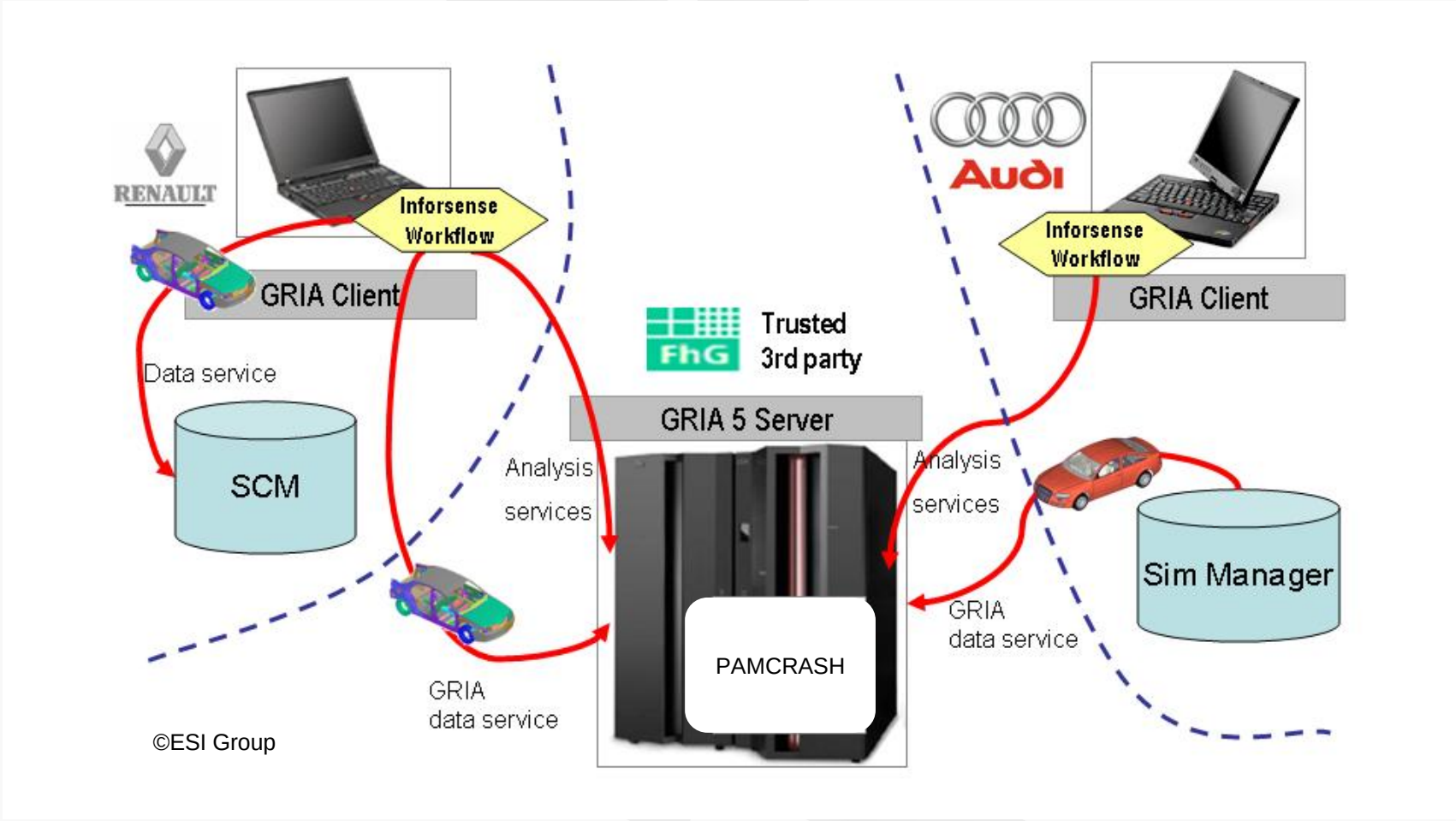
Crash Compatibility Testing



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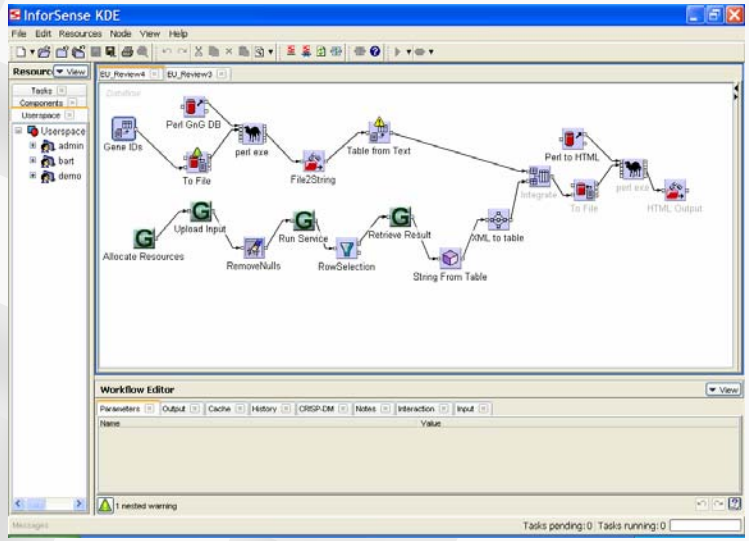
Collaborative Drug Discovery Testcase

- B2B and B2A collaborative drug discovery
- Bioinformatics data and analysis capabilities shared between organisations
- Distributed Bioinformatics workflows and data management over the Internet with commercial security



Galápagos

ULB

gsk

EMBL

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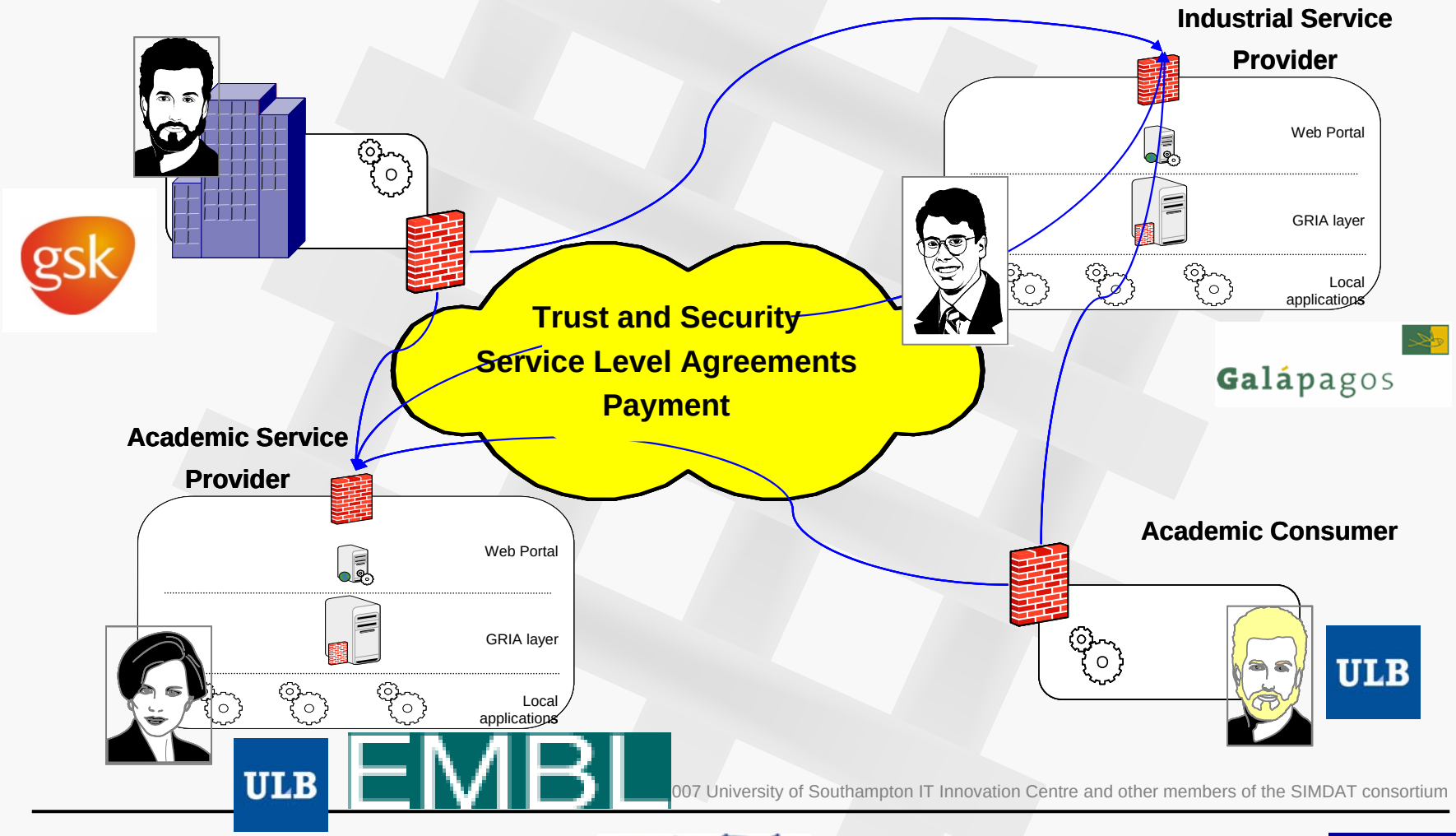
B2B/B2A Partnerships



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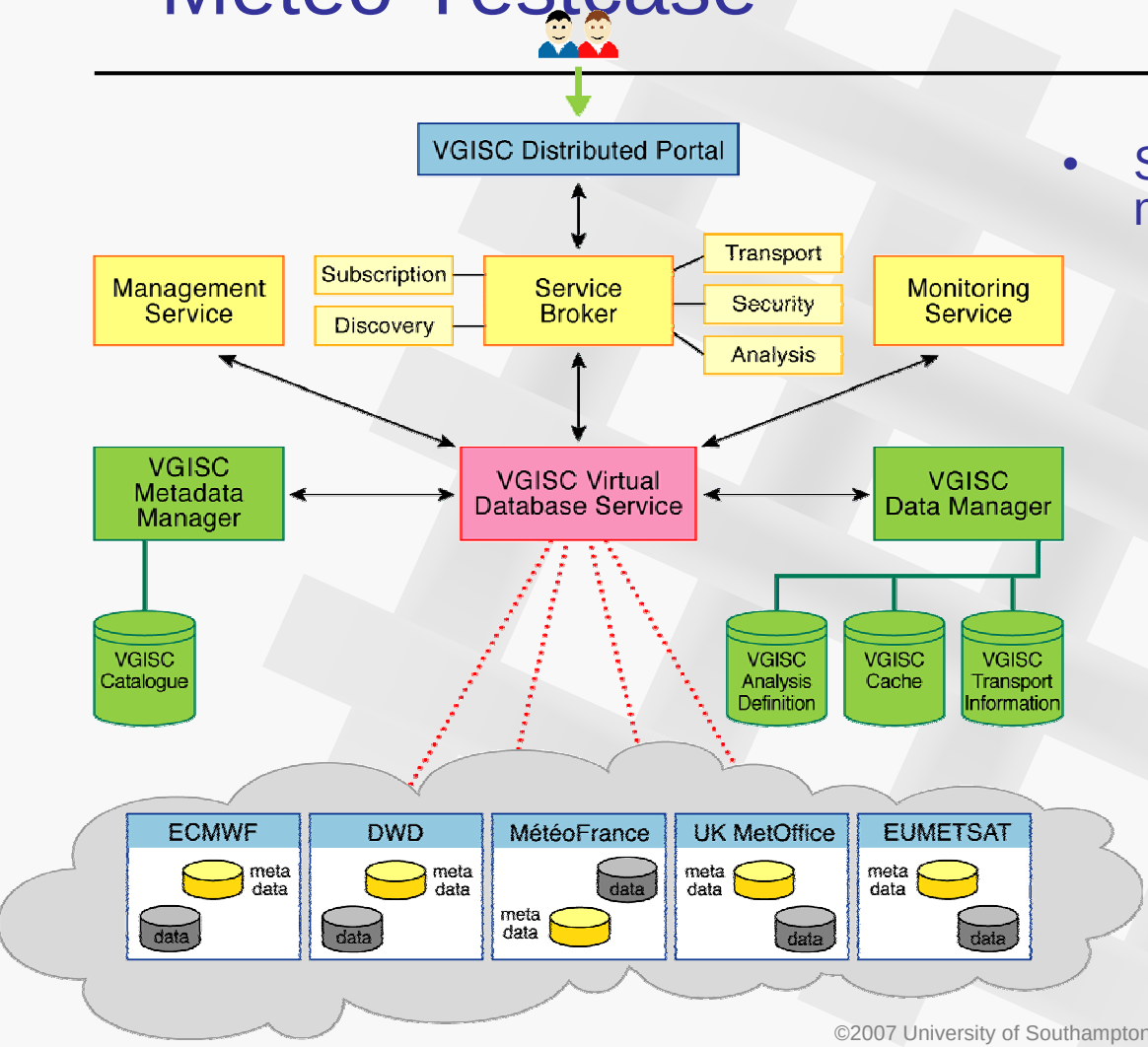
Meteo Testcase



- Single view of distributed meteorological databases
  - Improve visibility and access to data
  - Add value to existing data sets by enabling diverse databases to be used as a unique virtual resource
  - Virtual organisation (federated identity and access control)

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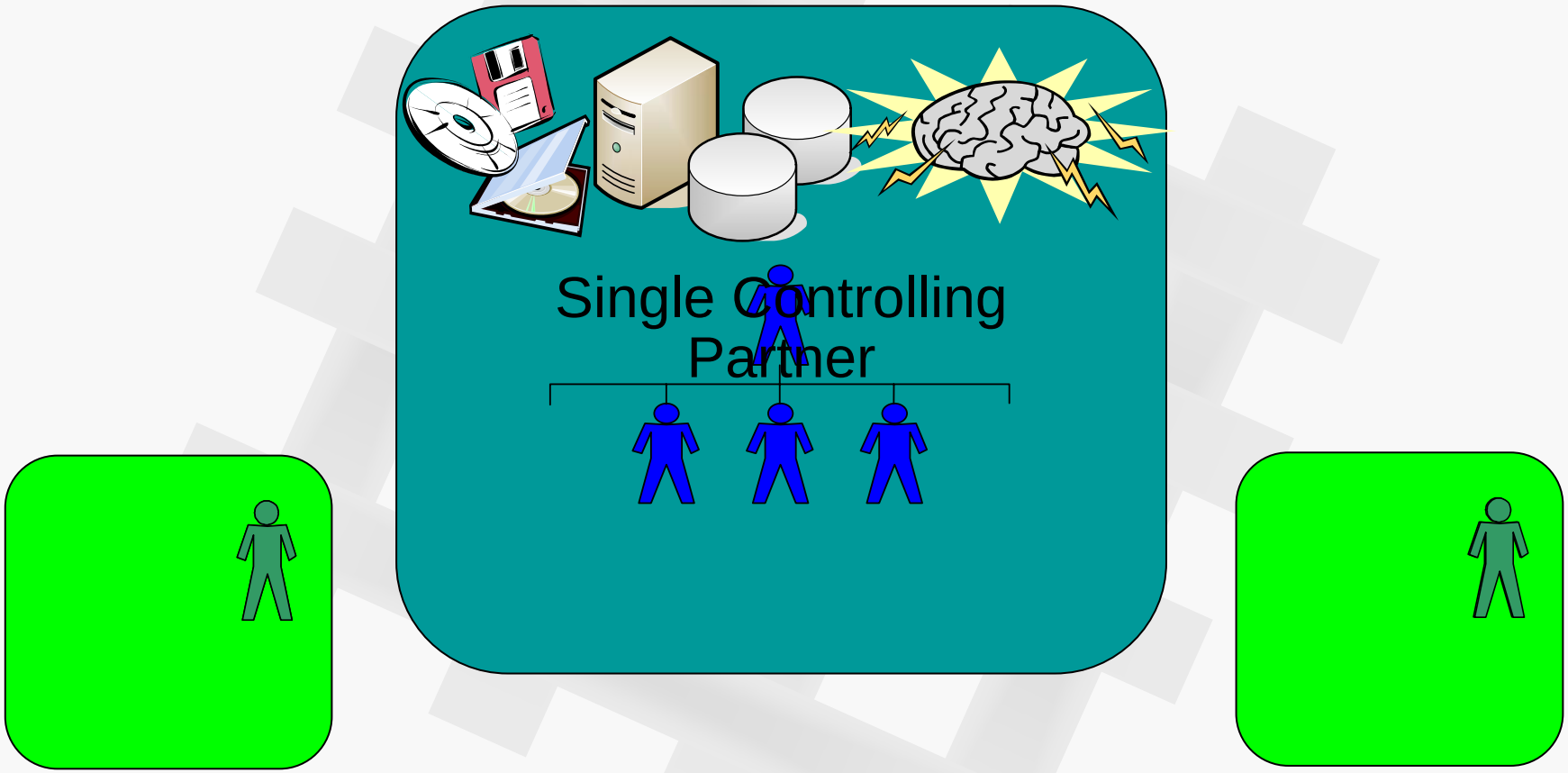
Contextual Collaboration: ***Virtual Employee***



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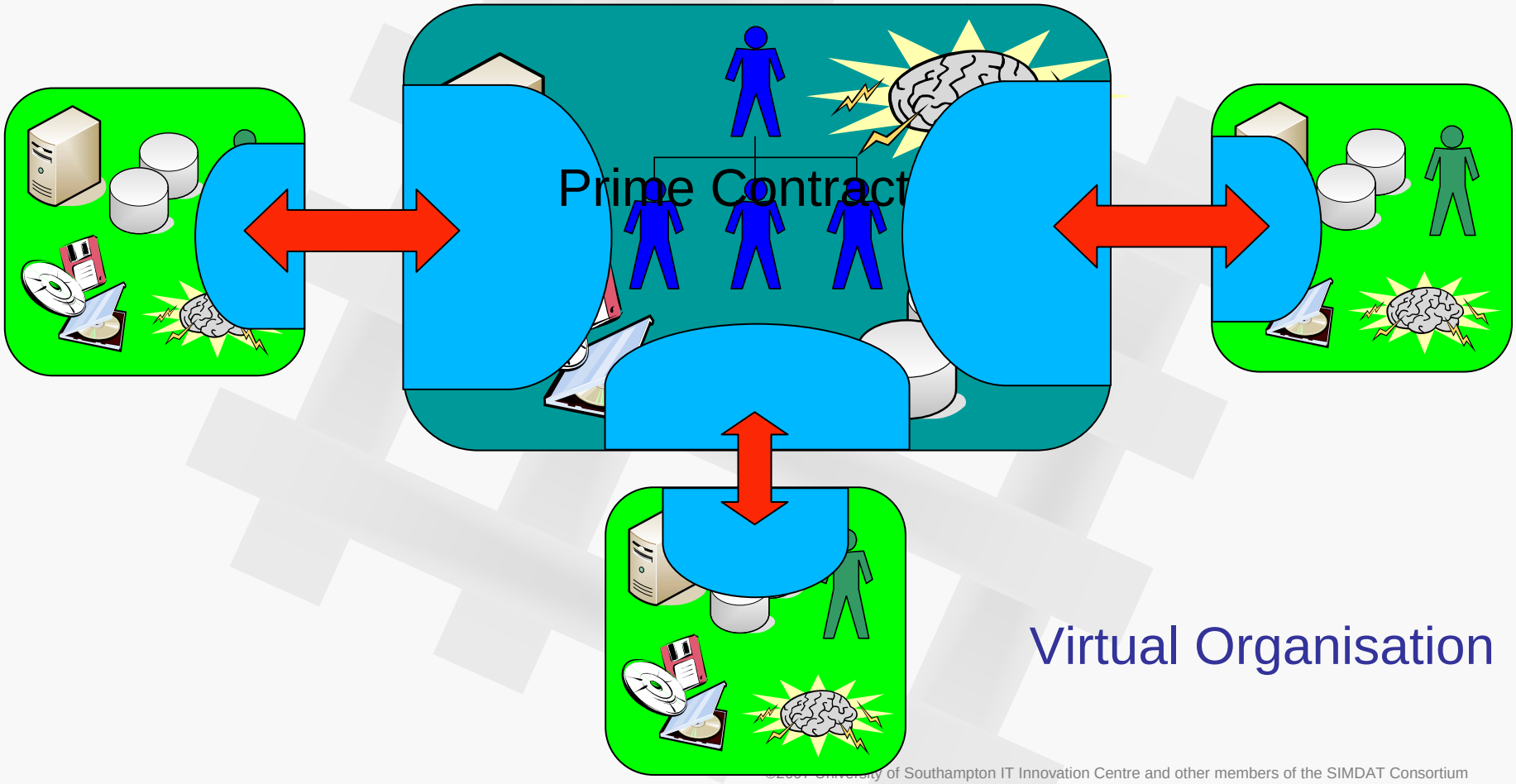
Extended Enterprise: ***Business Cooperative***



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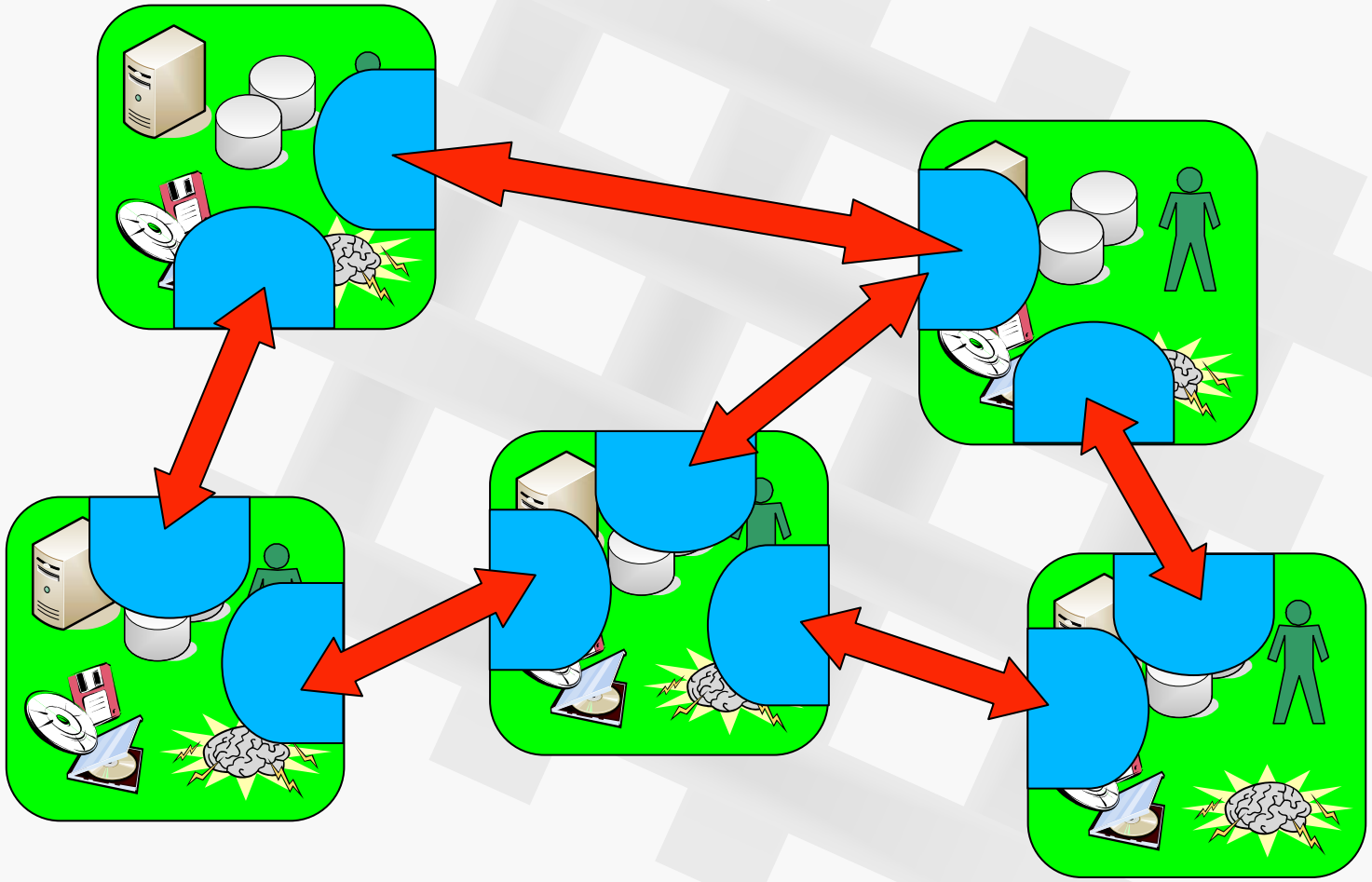
Extended Enterprise: ***Business Partnership***



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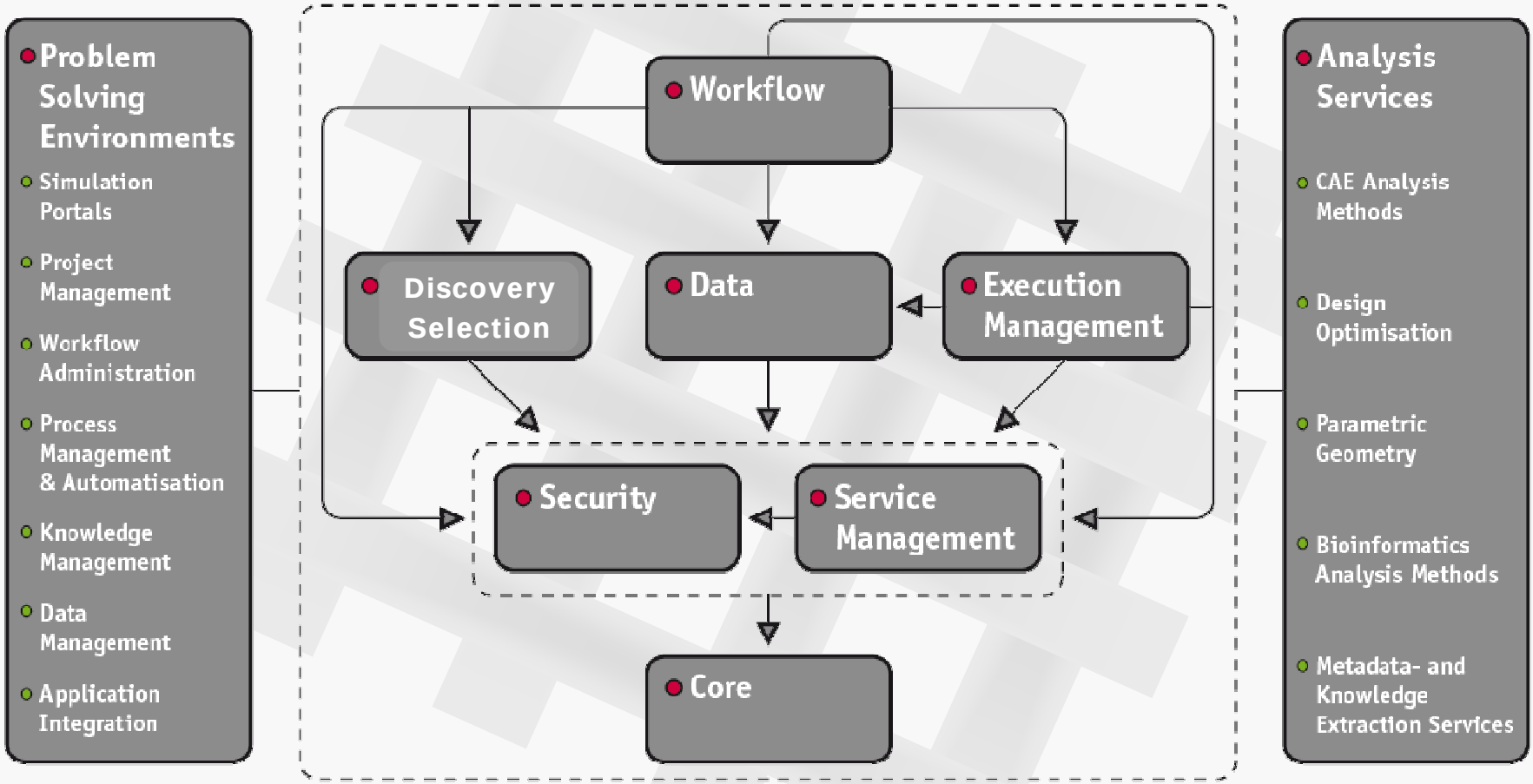
The SIMDAT Grid Solution Portfolio

- The Grid Solution Portfolio is a framework for delivering interoperable business Grids
  - used to build domain-specific Grid solutions
  - used to communicate SIMDAT ideas, structure and results to application communities within and beyond SIMDAT
- Design based on service oriented architecture principles and Web Service specifications

The SIMDAT Architecture



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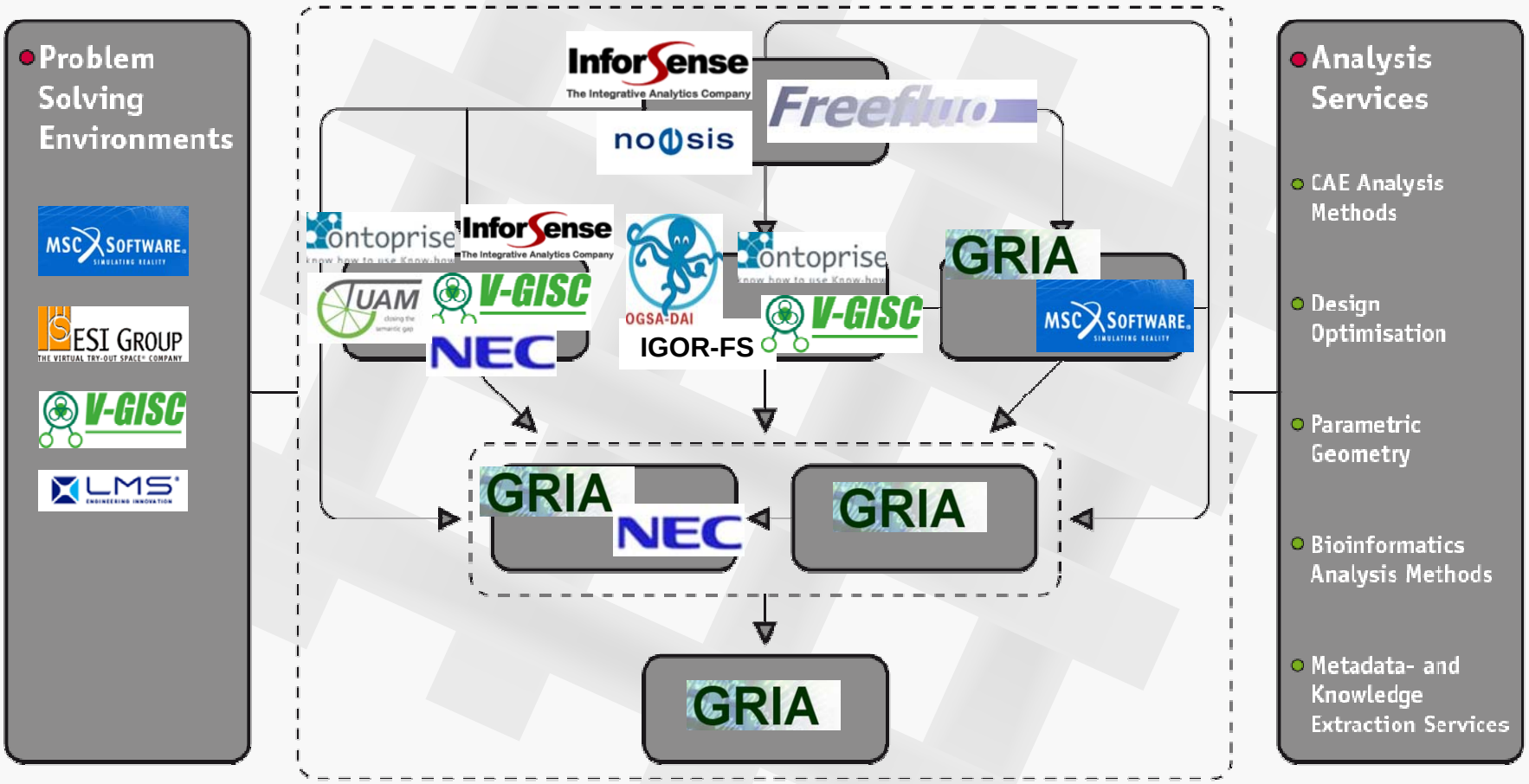
SIMDAT Technologies



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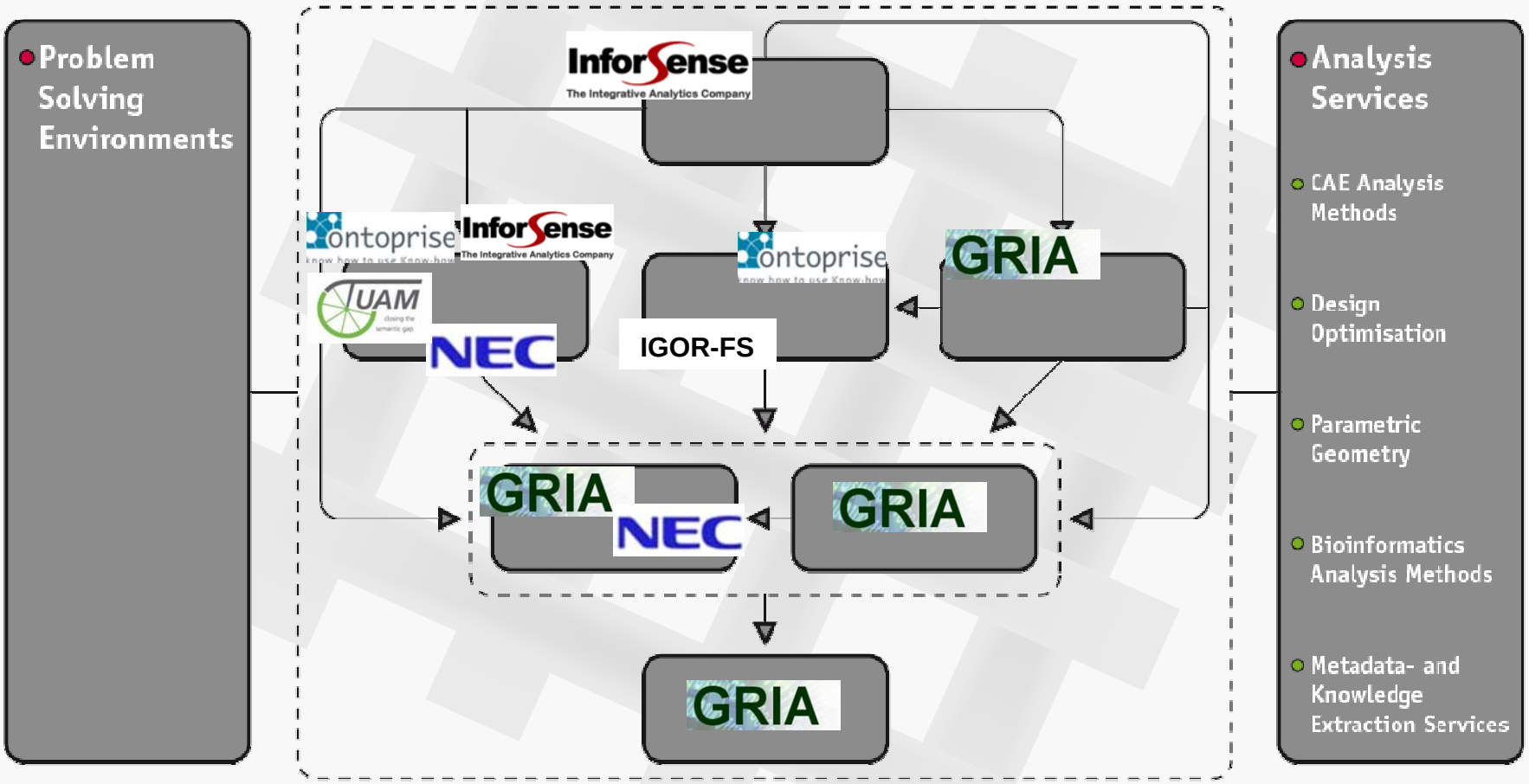
Pharmaceutical Domain Solution



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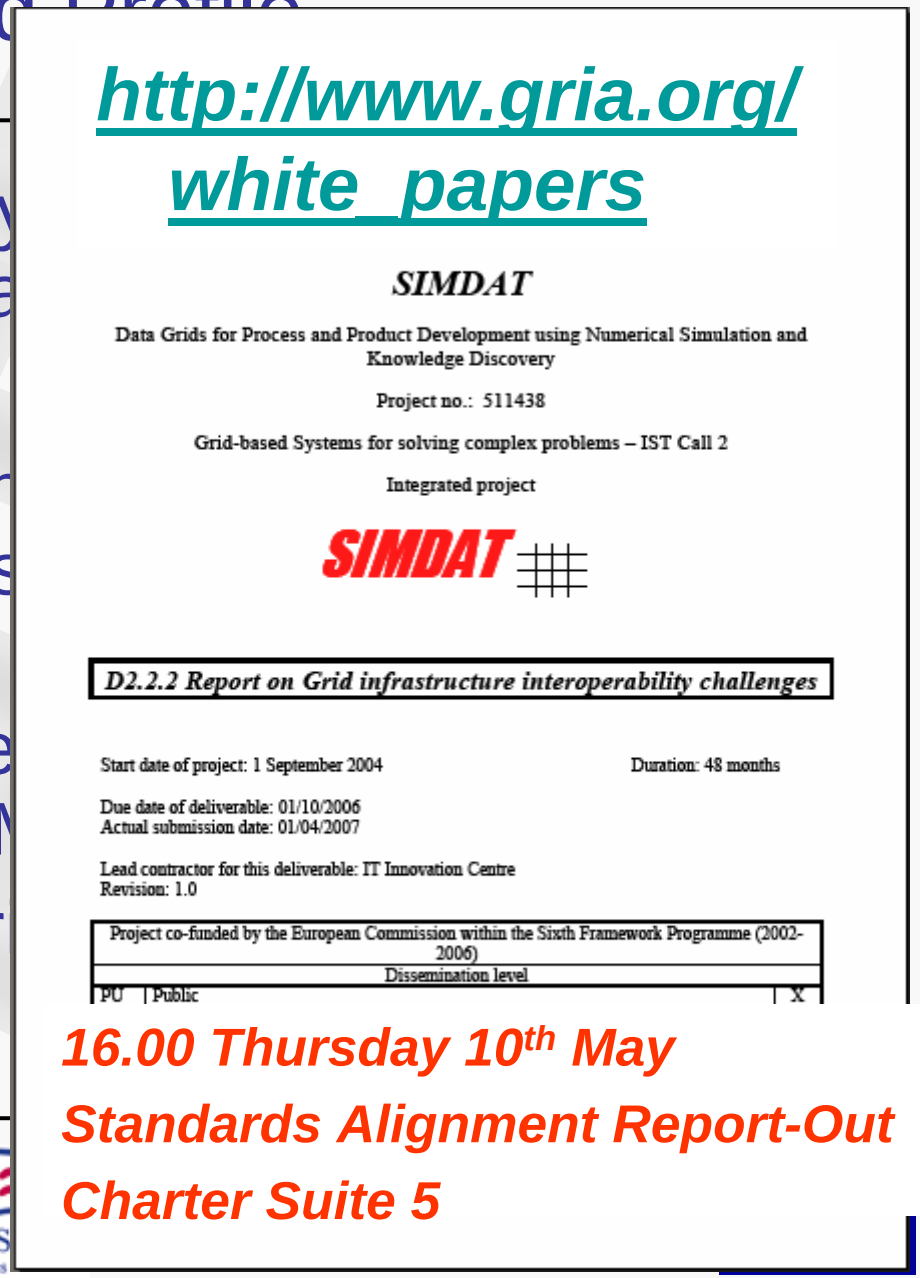
SIMDAT Industrial Grid Profile

- Adoption analysis of key interoperability specifica
- Motivation to
  - ***understand*** adoption industrial applications performance)
  - ***recommend*** how the safely adopted by SIM
  - ***publish*** Industrial Gr community e.g. OGF



http://www.gria.org/white_papers

SIMDAT

Data Grids for Process and Product Development using Numerical Simulation and Knowledge Discovery

Project no.: 511438

Grid-based Systems for solving complex problems – IST Call 2

Integrated project

SIMDAT

D2.2.2 Report on Grid infrastructure interoperability challenges

Start date of project: 1 September 2004 Duration: 48 months

Due date of deliverable: 01/10/2006
Actual submission date: 01/04/2007

Lead contractor for this deliverable: IT Innovation Centre
Revision: 1.0

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination level		
PU	Public	X

16.00 Thursday 10th May

Standards Alignment Report-Out

Charter Suite 5

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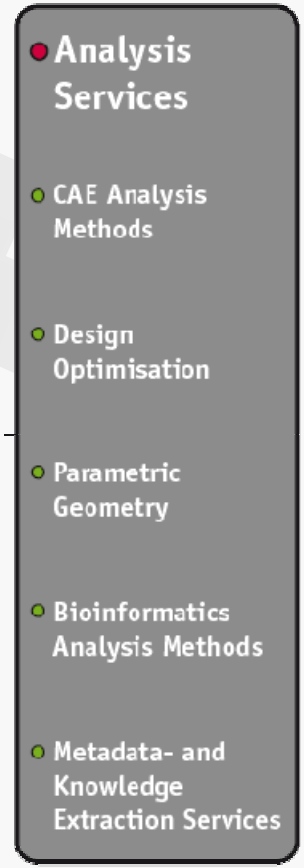
Analysis Services

Basic modules for computing, comparison and data analysis
Standard interface based on WebServices

The SIMDAT analysis services include:

- **CAE Analysis Methods**
  - PAM-CRASH (ESI)
  - MD NASTRAN (MSC)
  - CFD SOLAR (BAE)
  - ELFIPOLE (EADS)
- **Design Optimisation**
  - LMS Optimus Metamodel (NOESIS)
  - DoE Services (UoS)
  - RMS Services (UoS)
- **Parametric Geometry**
  - Geometry Services (UoS)
- **Bioinformatics Analysis Methods**
  - EMBOSS suite
  - BLAST suite
  - IPRSCAN
  - BIOCLIP (Inpharmatica)
- **Metadata- and Knowledge Extraction Services**
  - Grid-enabled Weka (FhG-IAIS)
  - Metadata Extraction Service (FhG-SCAI)



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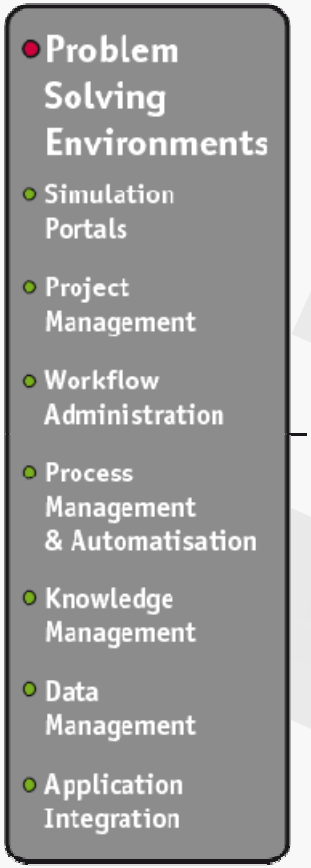
Problem Solving Environments



- Interface to the end-user
- Grid-enabled versions of existing solutions
  - MSC SimManager (MSC)
  - LMS Tec.Manager (LMS)
  - Visual Composer (ESI)
  - Pharma federated portal
  - V-GISC (ECMWF)
  - Optimus (LMS)
  - Taverna/FreeFluo (IT Innovation)
  - KDE (Inforsense)
  - (Modelcenter, Fiper)
  - (MATLAB)

GRIA: A Grid for business

- Open Source Grid middleware for supporting B2B collaborations based on a service-oriented architecture
- Easy to use yet powerful functionality
  - business-to-business accounting and service level agreements
  - dynamic trust and security
  - distributed file transfer, storage and processing
  - distributed database access using OGSA-DAI
  - distributed inter-domain workflow composition, enactment and publication using Taverna/Freefluo
  - cross-platform, running on Windows XP and various Linux distributions
  - developers kit for new managed application services
- Available free and open source from http://www.gria.org

Op Scenarios

I want to manage my organisation's relationships, and decide who in my team (and partners teams) can access my resources

Project Manager

Client Management

Service Level Agreement

Service Provider Management

I want to provide applications and data services and specify terms and conditions for using them

Administrator

Access Constraints

Usage Constraints

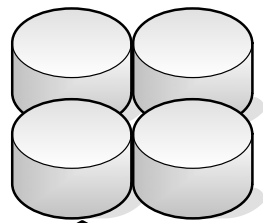
I want to use high-end applications, but I don't have enough processing power

Engineer

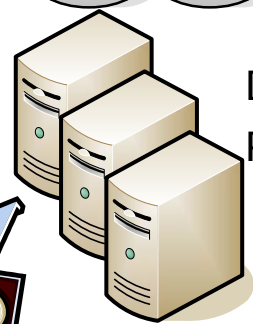
Client

I hate all this management stuff anyway, it gets in the way of my work

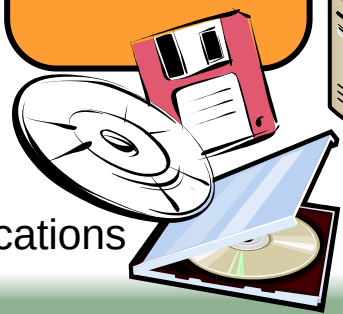
Basic Application Services



Data Storage



Data Processing

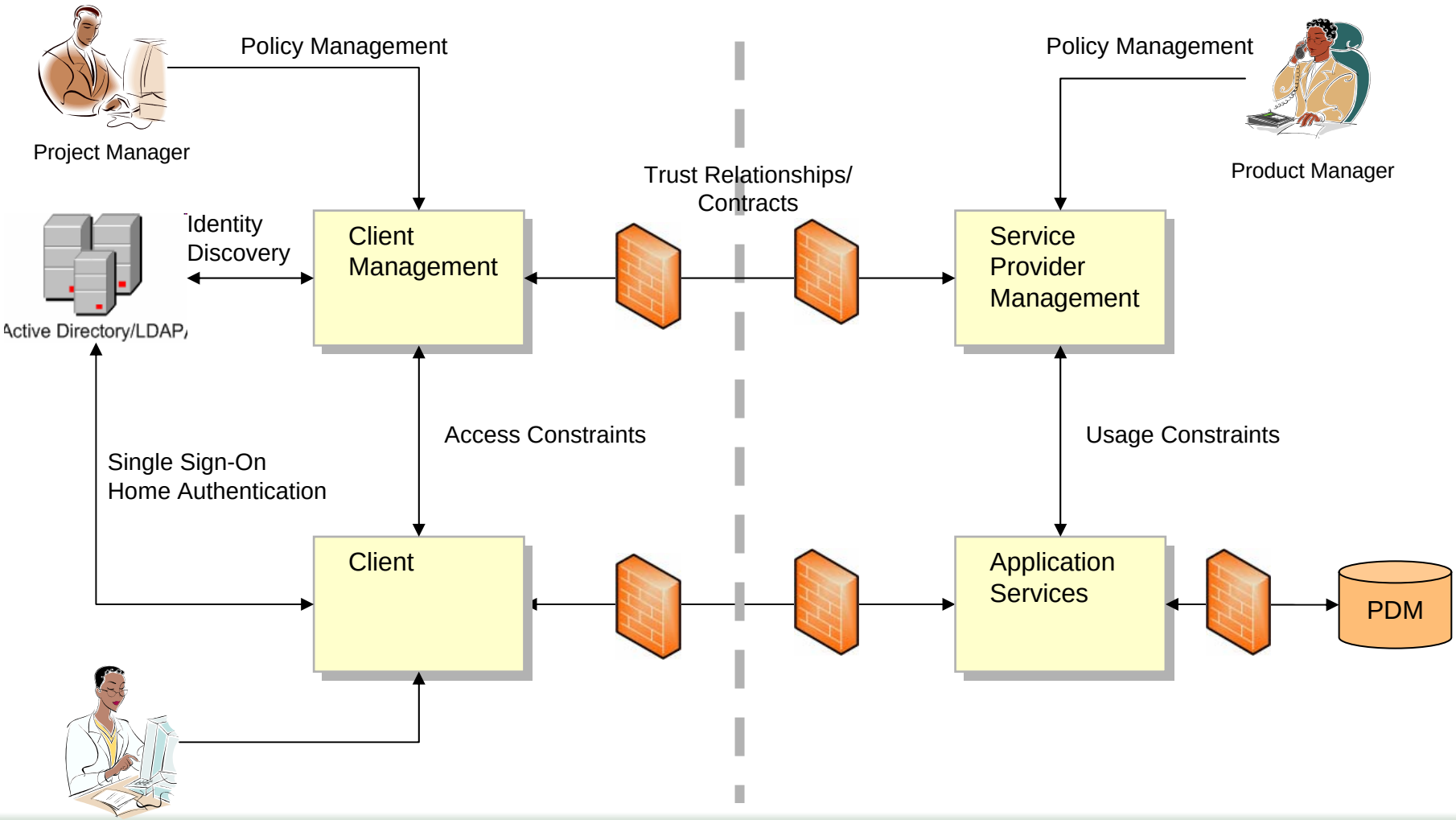


Applications

Client Organisation

Service Provider

Enterprise Security Integration



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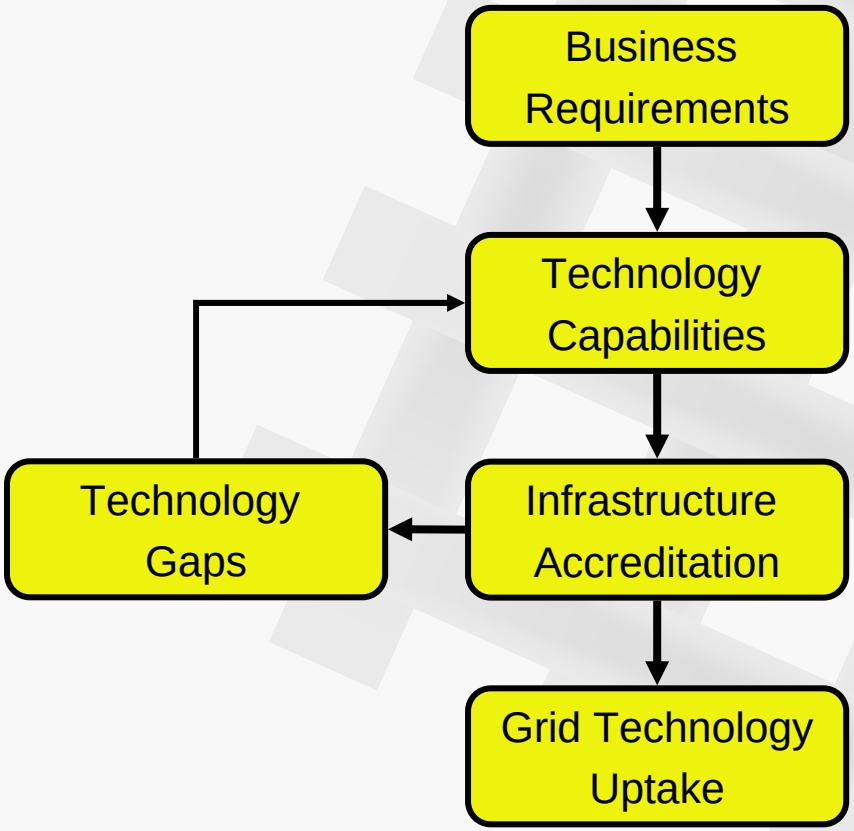
How do we validate our approach?



- Collaboration patterns
- Operational security policies

- Dynamic trust and security (GRIA)
- SLA management and accounting (GRIA)
- E2E Toolkit (NEC)
- Dynamic Access Control (NEC, IT Innov)

- Transatlantic Secure Collaboration Programme (www.tscp.org)
- Risk analysis

Conclusions

- SIMDAT is delivering business Grid middleware for inter-enterprise collaboration
- The Grid solution portfolio developments are driven by industrial requirements
- GRIA middleware satisfies many of the requirements for industrial collaboration
  - site independence based on distributed management
  - dynamic trust and security using best-practice
  - SLA based monitoring, management and billing
- Key technologies are undergoing accreditation by industrial partners
  - technological gaps have been identified
  - gaps being addressed during the final project phase

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Thank you for listening

- www.simdat.eu
- www.gria.org

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