



European Commission



Information Society
Technologies



BE 16 – Ship Building

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Grid Services for ship yards and their suppliers

Who are we ?

A consortium of Ship Builders (FSG), Consultants (CMT), Technology Providers (SCAI, DLR) and a Service Provider (T-Systems)



What is the problem ?

European ship yards and their suppliers need to design ships in an extremely short early design phase.

This early design is the basis for estimated costs (including life-cycle costs), risks and price negotiations.

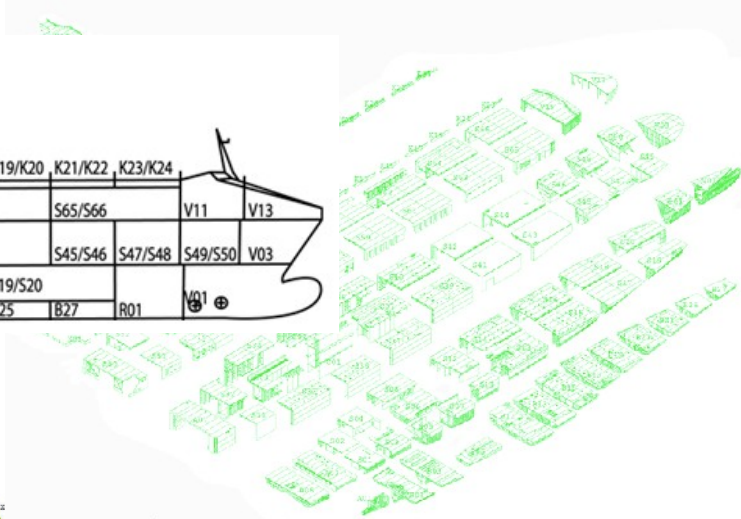
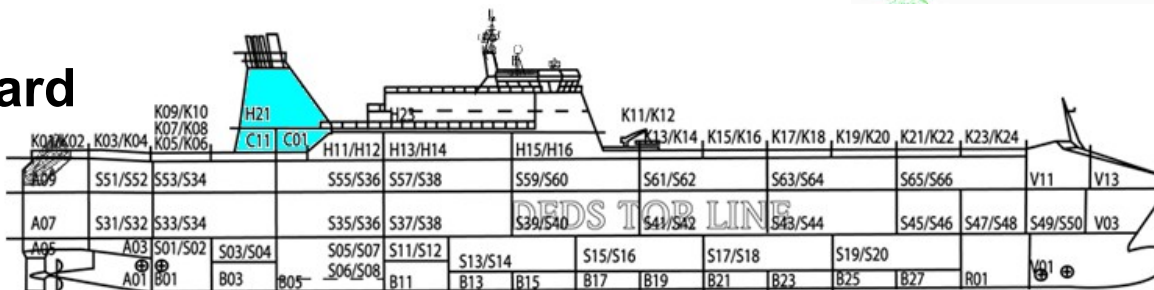
What is the solution ?

Grid extension of the integrated
Ship Design and Simulation System SESIS.

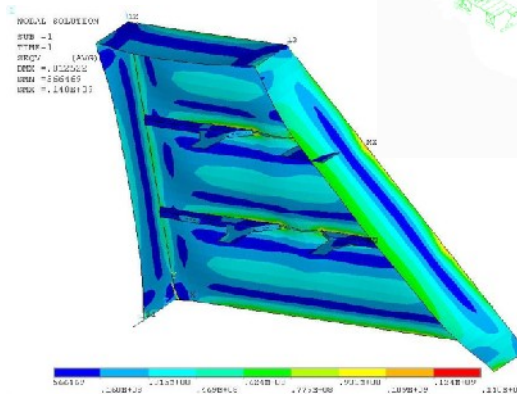


BE16 Business Model - Funnel Design -

Ship Yard



Consultant / Supplier



Service Provider



SESiS

Integrated Simulation Platform

Open Integration Environment

eclipse based, PlugIn technology
Integration of legacy codes by wrappers
GUI integration

VO Platform

Right and role management
Secure data and method access

Platform for Distributed Systems

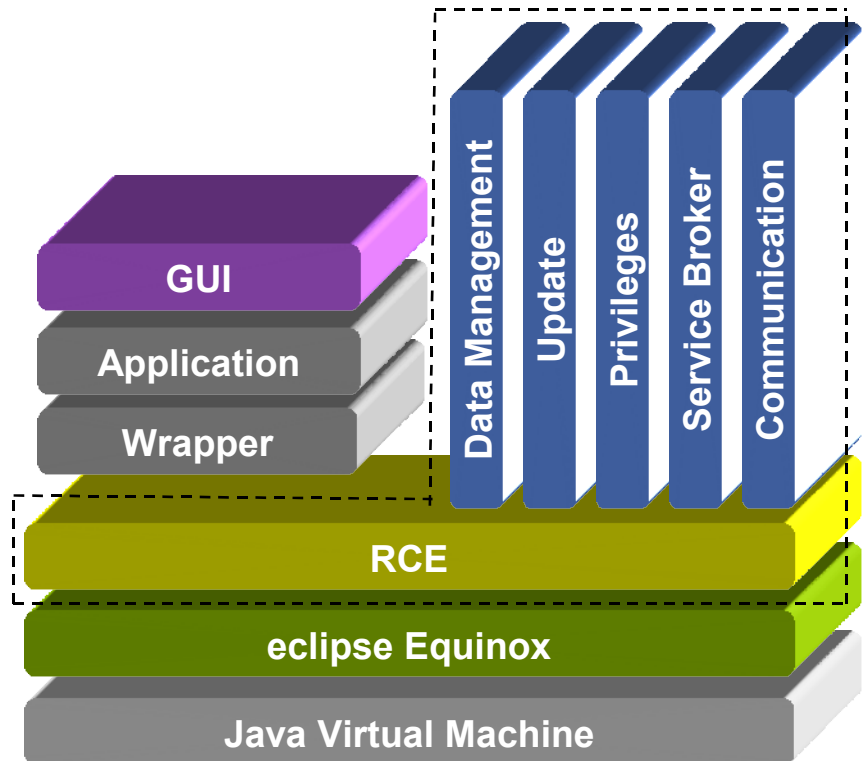
Secure communication channels

Enhanced by Grid Interfaces

On-demand allocation of HPC resources

Applicable in all engineering sectors

Enables collaboration between OEM,
suppliers and consultants
e.g. automotive, aircraft, ship building



SEISIS - Data Management

Local Data Management

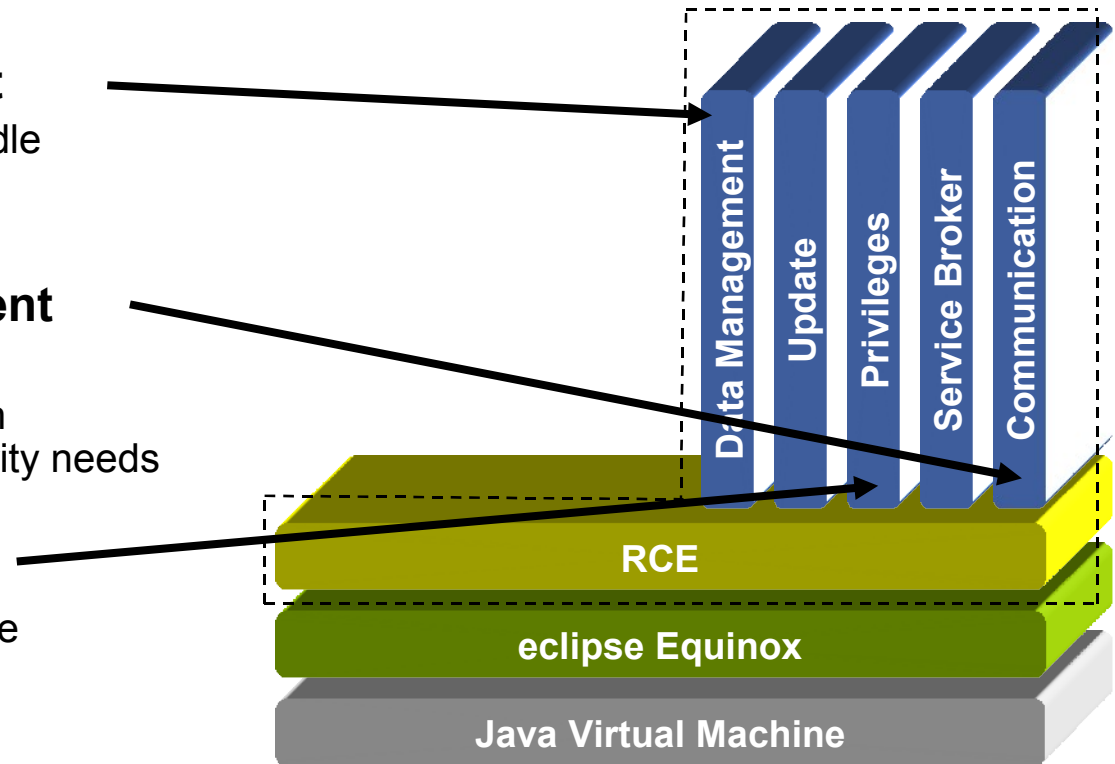
by Data Management bundle
File and database access

Remote Data Management

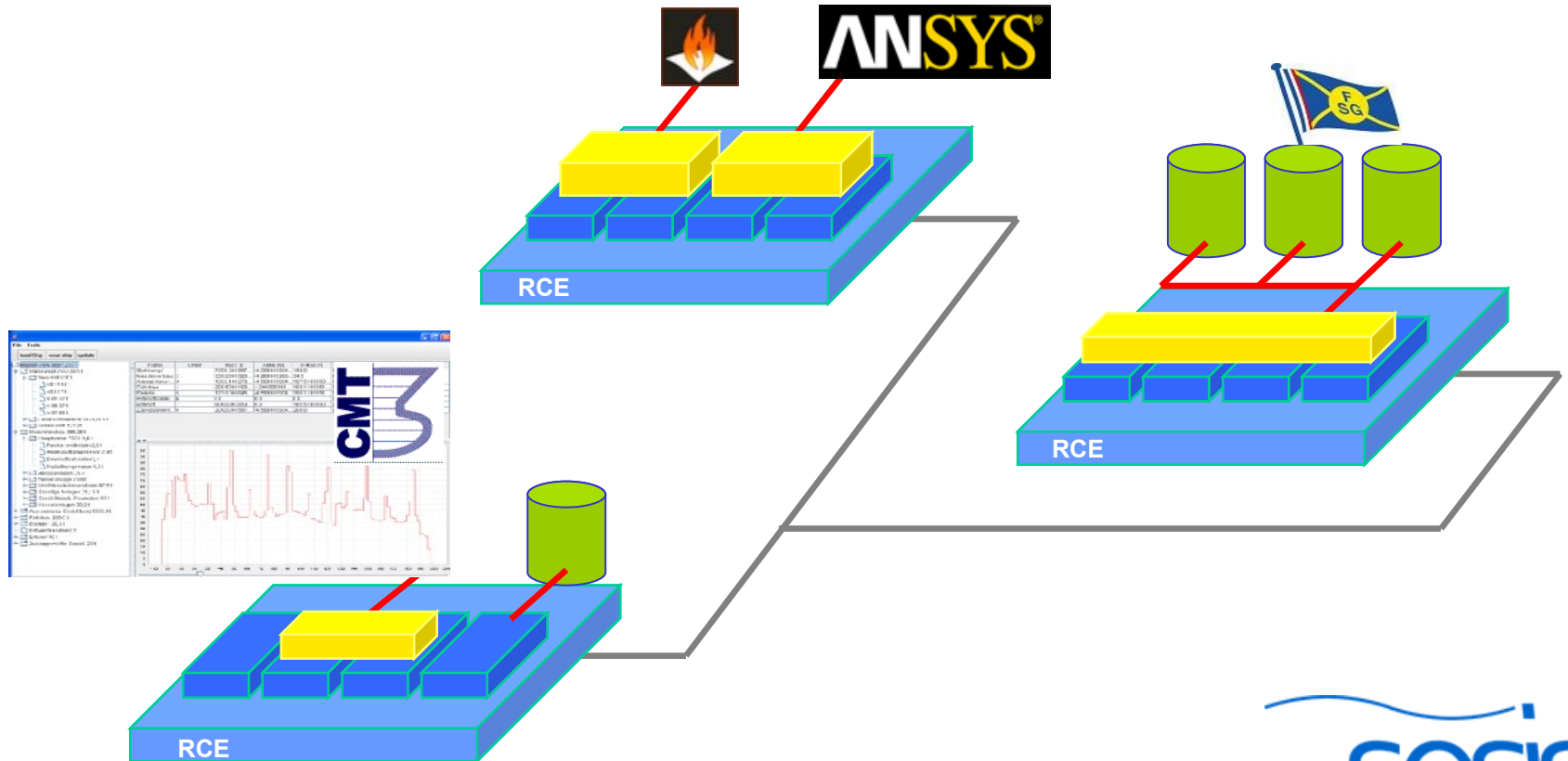
via communication bundle
Adaptive protocol selection
on speed and security needs

Access Rights

handled by Privilege bundle
Certificate based
Owner of a resource
defines access rights
Applicable for Data & Codes



SEGIS at work



Generic Grid PlugIn

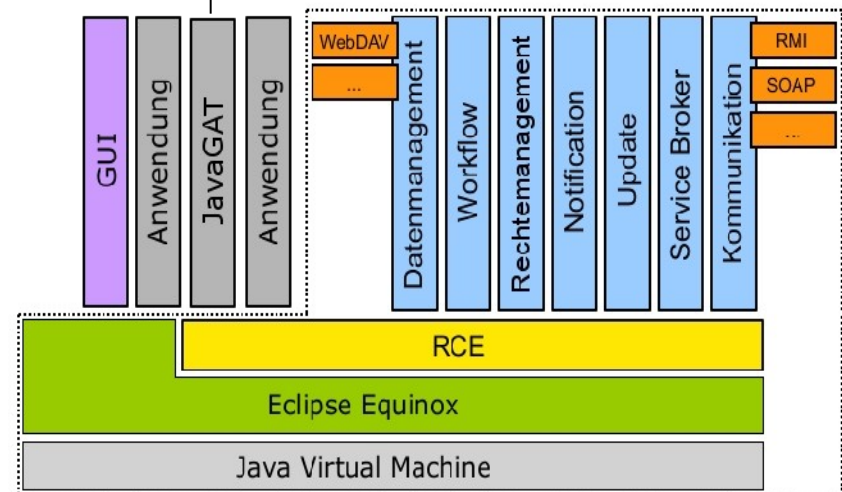
Access to Grid resources

- File management
- Job submission and monitoring

UNICORE6 solution with GPE

Globus solution with GAT

→ Applicable for all applications
plugged into SESIS



Demonstrators

FDS - Fire Dynamics Simulator

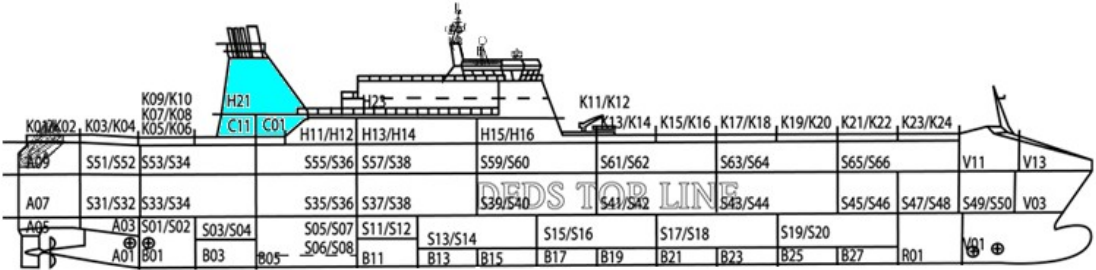
GridBean / GUI for FDS specific parameters

→ Many other compute intensive applications available

BE16 Use Case

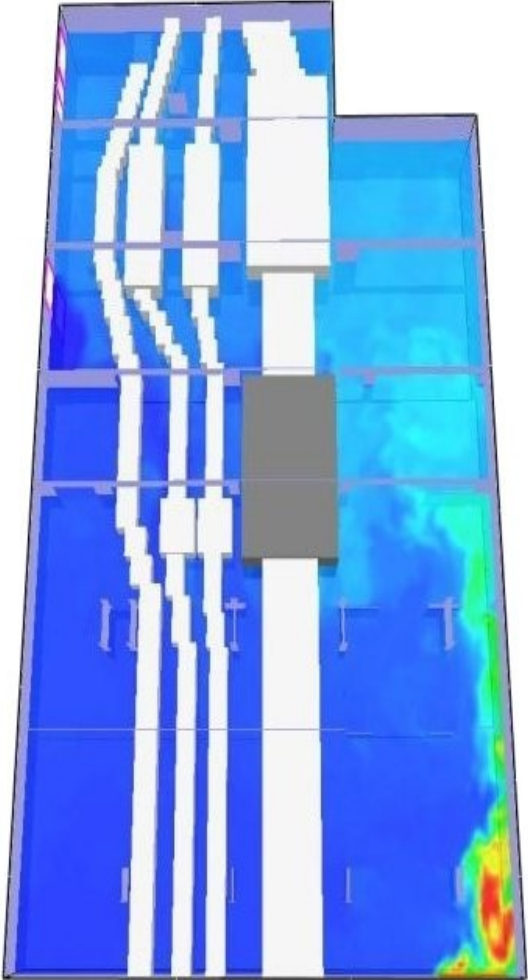
Ship Building Industry

RCE + Ship Building methods = SESIS



Fire Simulation as Demonstrator

Applicable for other compute intensive applications



The Ship

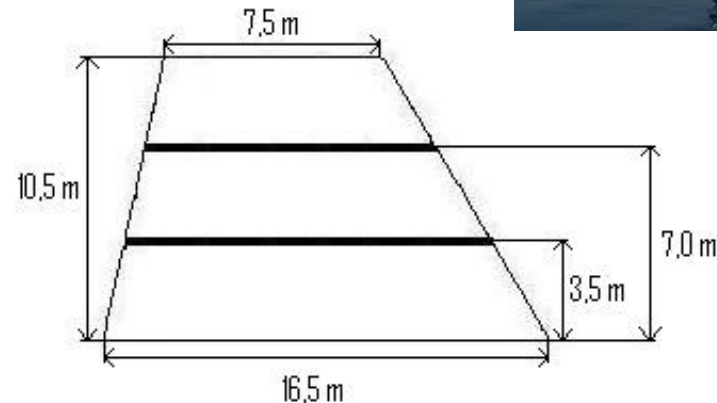
Ship

190 m RoRo Ship of
Flensburger Schiffbau
Gesellschaft FSG



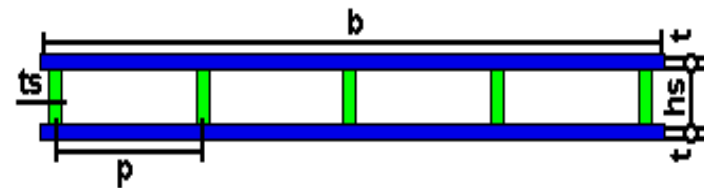
Funnel

24 m x 13,1 m x 3,2 m



Material

Steel Sandwich Panel I-Core
Manufactured by Meyer Werft

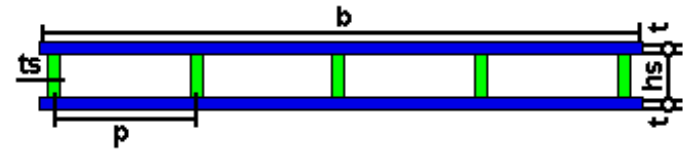


The Process

1. Minimise I-Core Dimensions

Minimize weight of I-Core structure

Computed with ESAComp



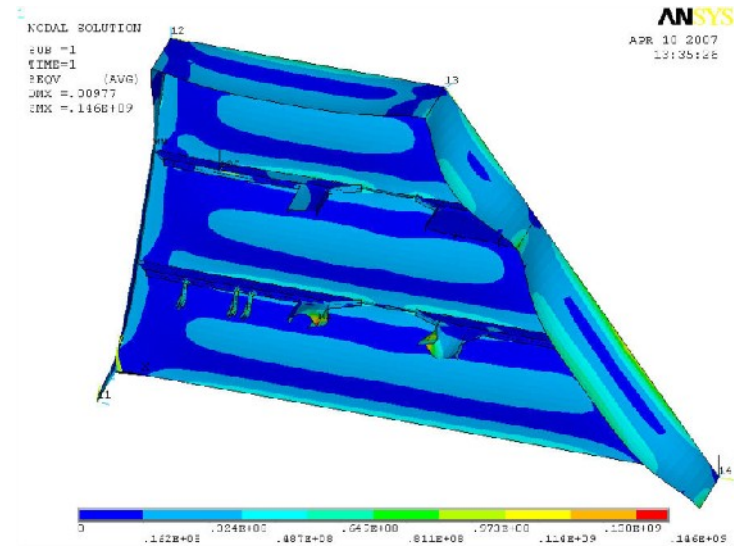
$$t=ts=3\text{mm} \quad hs=40\text{mm} \quad p=120\text{mm}$$

2. Minimise Stress and Resonance Frequency

maximal stress < 160 Mpa

frequency > 20 Hz

Modelled and computed with ANSYS



3. Verify Fire Safety

...

Fire Safety Simulation

Funnel model

10 cm = 240 x 131 x 32 ~ 1 Mio. unknowns

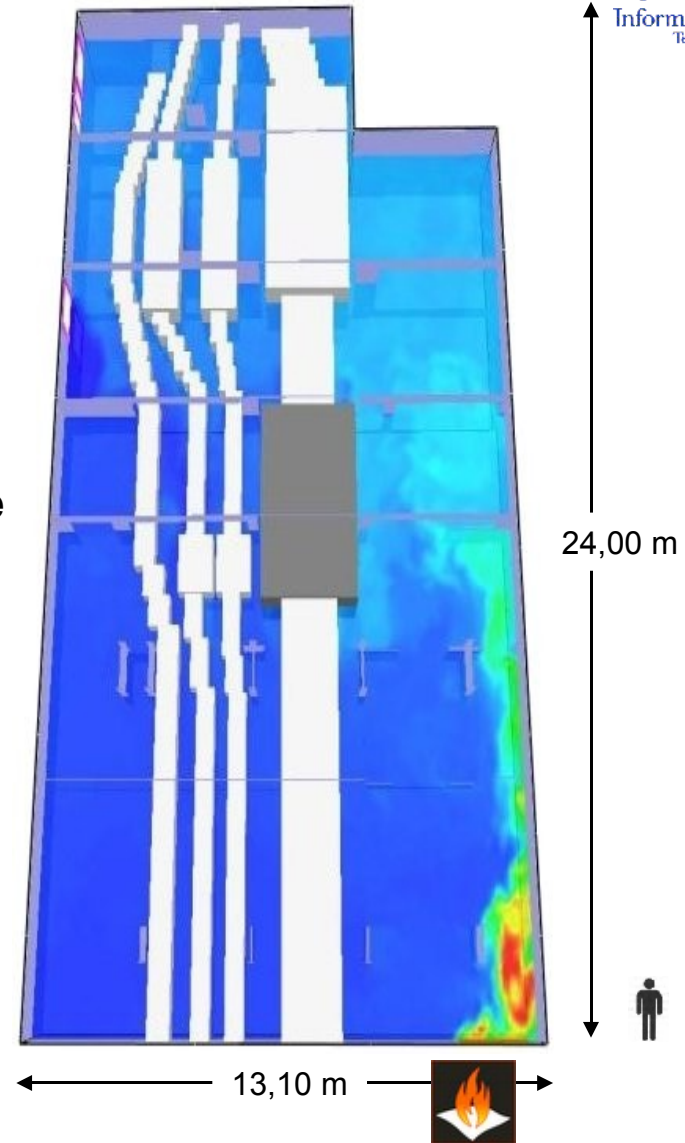
Target of fire simulation

- 60 min real time simulation for A-60 fire rating
- Temperature < 180° C on unexposed side

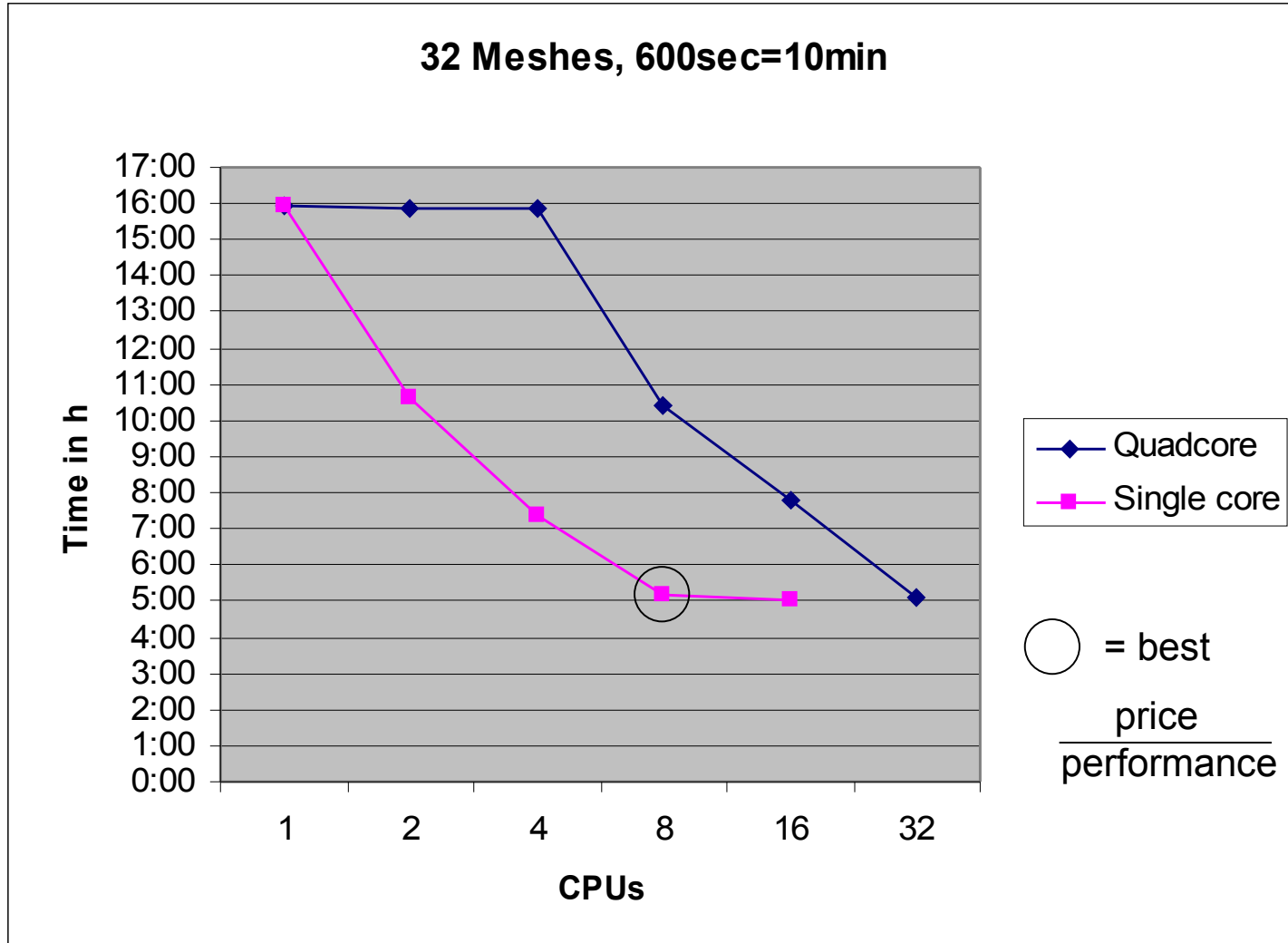
Simulation of 10 min real time

- 184,000 iterations
- Calculated on one PC: 106 hours

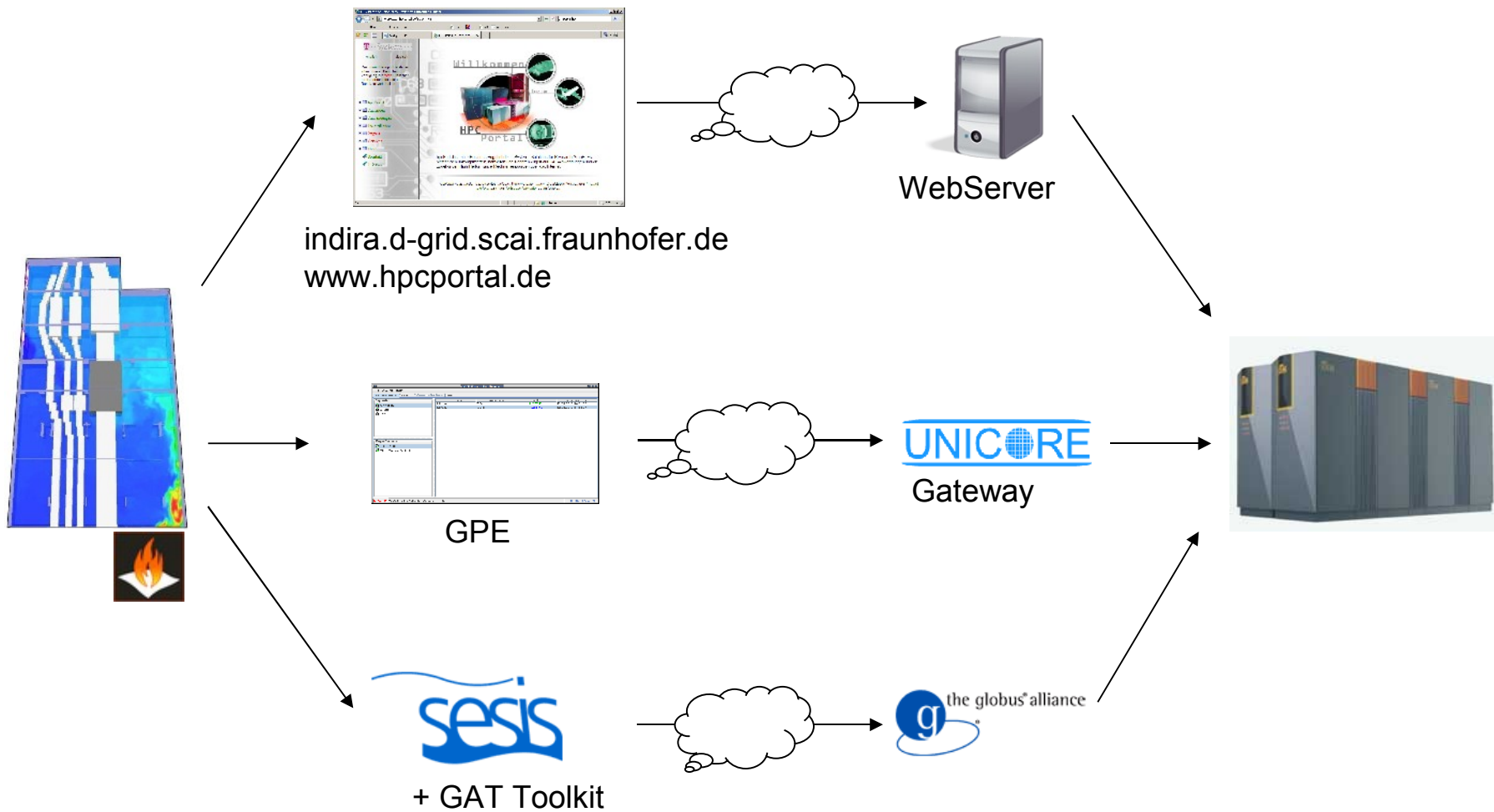
→ 60 min real time simulation ≈
1 month calculation time



32 Meshes



ASP Access Modes



UNICORE6 Results

Job jobs could be submitted to the small SCAI cluster

UNICORE6 ist too instable for production use

→ UNICORE6 approach stopped for this project

Alternatives have been developed

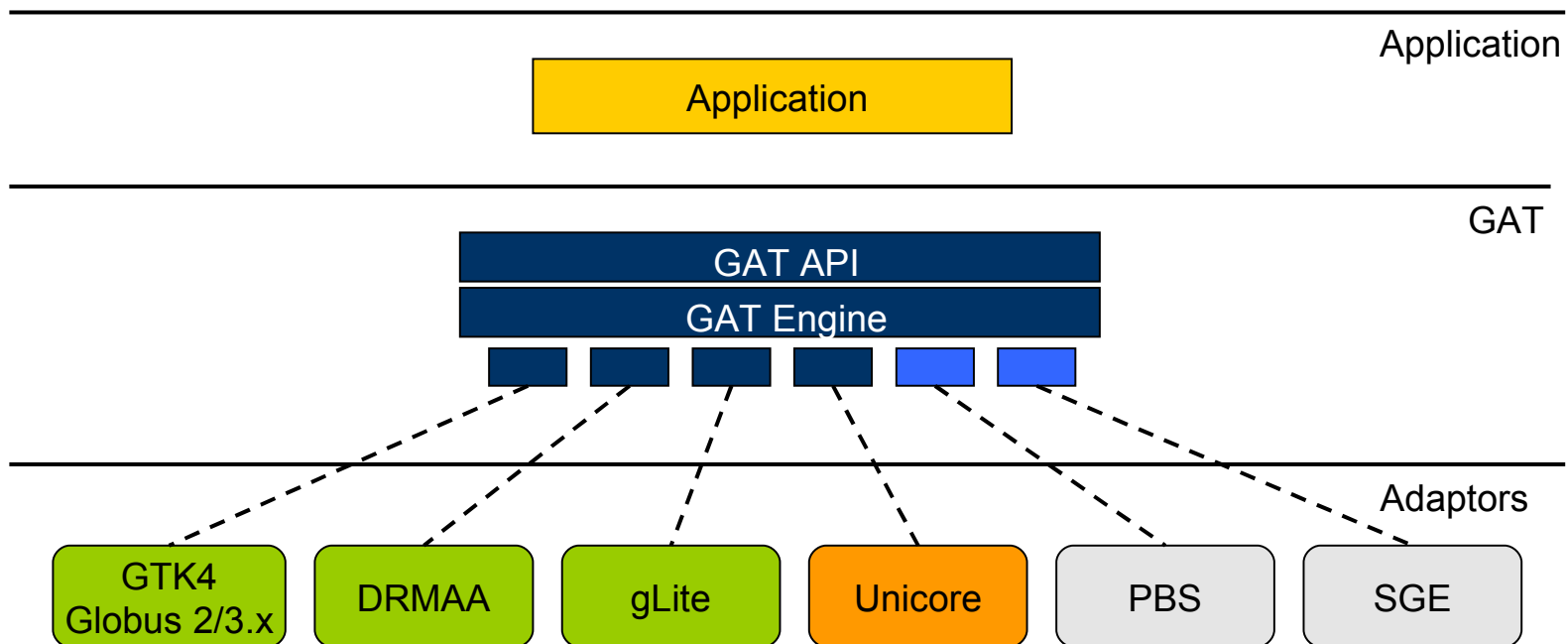
- Access via BE08 Portal**
- Globus GAT (DLR)**

New try when UNICORE6 gets more stable

- new UNICORE6 client on eclipse Technology available**

GAT – Grid Application Toolkit

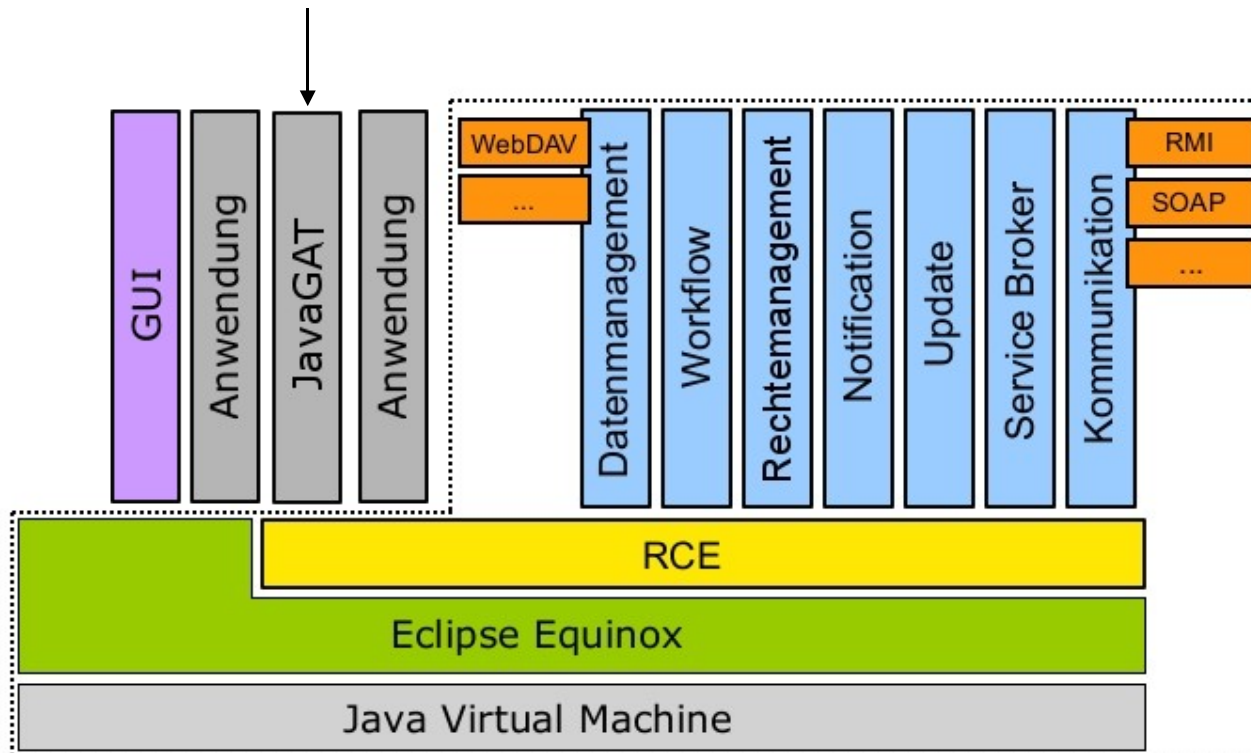
- Abstraction of the Grid by standard interfaces
- Adaptors for different Middlewares
- Implementations: C-GAT and JavaGAT



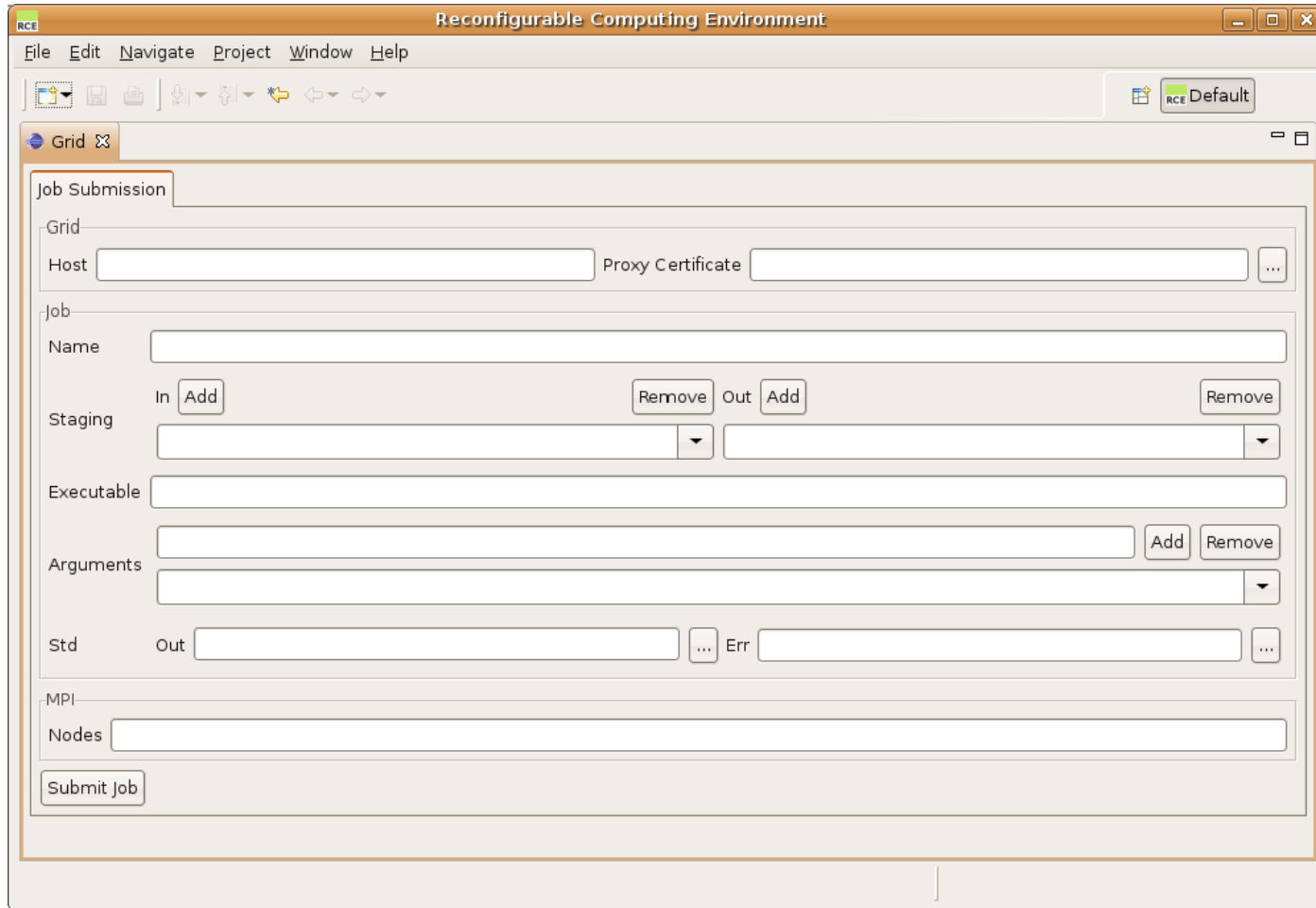
SEGIS Integration

SEGIS – Plugin-based system

→ Integration as JavaGAT-Plugin



SEGIS PlugIn for FDS via GAT



The screenshot shows the 'Reconfigurable Computing Environment' (RCE) application window. The title bar reads 'RCE Reconfigurable Computing Environment'. The menu bar includes 'File', 'Edit', 'Navigate', 'Project', 'Window', and 'Help'. The toolbar contains various icons for file operations and navigation. The main content area is titled 'Grid' and contains a 'Job Submission' form. The form is organized into several sections: 'Job Submission' (with a sub-section 'Grid' containing 'Host' and 'Proxy Certificate' fields), 'Job' (with 'Name' field), 'Staging' (with 'In' and 'Out' sections, each containing 'Add' and 'Remove' buttons and a dropdown menu), 'Executable' (with a text field), 'Arguments' (with a text field and 'Add'/'Remove' buttons), 'Std' (with 'Out' and 'Err' fields, each with a dropdown menu), and 'MPI' (with 'Nodes' field). A 'Submit job' button is located at the bottom left of the form area.

Demonstrations

Globus GAT (DLR)

- FDS installation on the D-Grid Cluster at SCAI
- GAT Interface for RCE/SEISIS
- FDS PlugIn for RCE for job submission

Access via BE08 Portal

- FDS installation on the D-Grid Cluster at SCAI
- Job submission via Portal
- Developed by Fraunhofer SCAI in BE08

Cost per Job

FDS (Fire Dynamics Simulation) is Open Source

- Optimal price/performance: 32 Meshes on 8 Nodes
 - Total time: 30 hours on 8 nodes ~ 240 node-hours
 - Hardware usage ~ 0.50 € per node-hour
- **120 €** per job

ANSYS

- Additional license cost for ANSYS
 - 15 € per node-hour ~ 120 € on 8 nodes = 3.600 €
- **3.720 €** per job

Conclusion

SEISIS

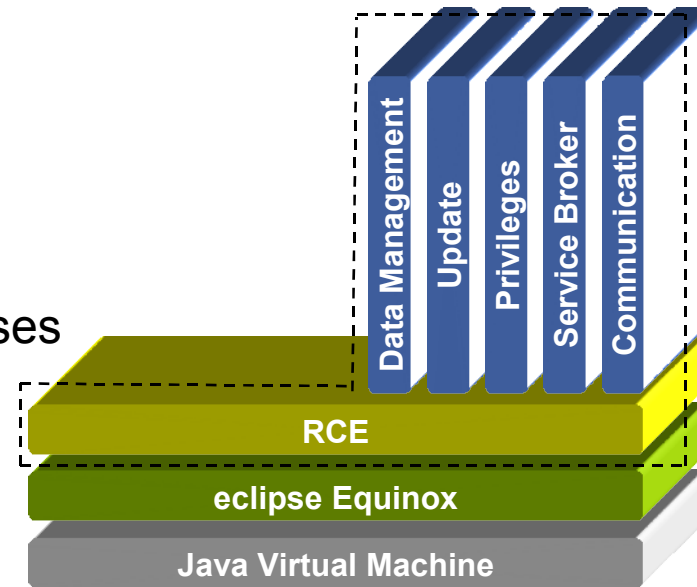
Flexible integration platform
for industrial design processes
VO management integrates
OEMs and their suppliers

+ Grid Interfaces

Brings HPC services on-demand to the engineer's desktop
Applicable for many compute intensive applications

+ Simulation Methods

Integrated simulation environment
Tailored for specific sectors: SEISIS = Ship Building Industry
Applicable for many industry sectors



Deliverables

✓	D0.2.1	Description of Work	09 / 2006
✓	PCA	Project Consortium Agreement	09 / 2006
✓	QPR06	Quarterly Progress Report (BE16 + SCAI)	11 / 2006
✓	D3.16.1	Use Cases / Requirements Elicitation	12 / 2006
✓	QPR09	Quarterly Progress Report (BE16 + SCAI)	03 / 2007
✓	D0.2.1	Description of Work (BE16 Update)	03 / 2007
✓	ID3.16.2	Business Model	03 / 2007
✓	ID3.16.1	Design specification	04 / 2007
✓	D3.16.2	Extended Progress Report (BE16 + SCAI)	06 / 2007
✓	CS12	Cost Statement	06 / 2007
✓	QPR15	Quarterly Progress Report (BE16 + SCAI)	09 / 2007
✓	ID3.16.3	Industrial Implementation	11 / 2007
✓	EPR18	Extended Progress Report (BE16 + SCAI)	12 / 2007
✓	D3.16.4	Exploitation Plan	01 / 2008
✓	D3.16.5	Public Case Study	03 / 2008
✓	QPR21	Quarterly Progress Report (BE16 + SCAI)	03 / 2008
	D3.16.3	Extended Progress Report (BE16 + SCAI)	06 / 2008
	CS24	Cost Statement	06 / 2008
	D3.16.4	Result of business exploitation	06 / 2008

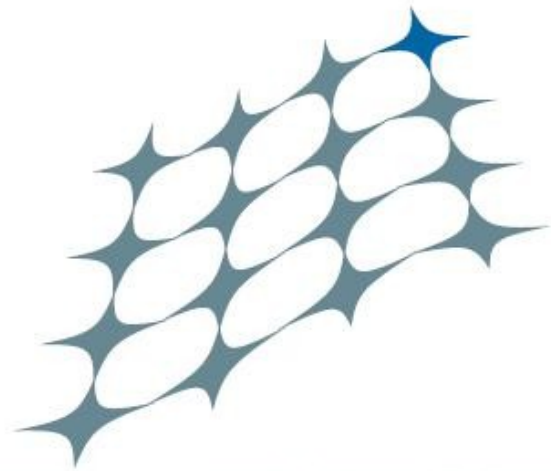
In total 26 official Deliverables in 20 months !



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BEinGRID
BUSINESS EXPERIMENTS IN GRID

THANK YOU