

SIMDAT

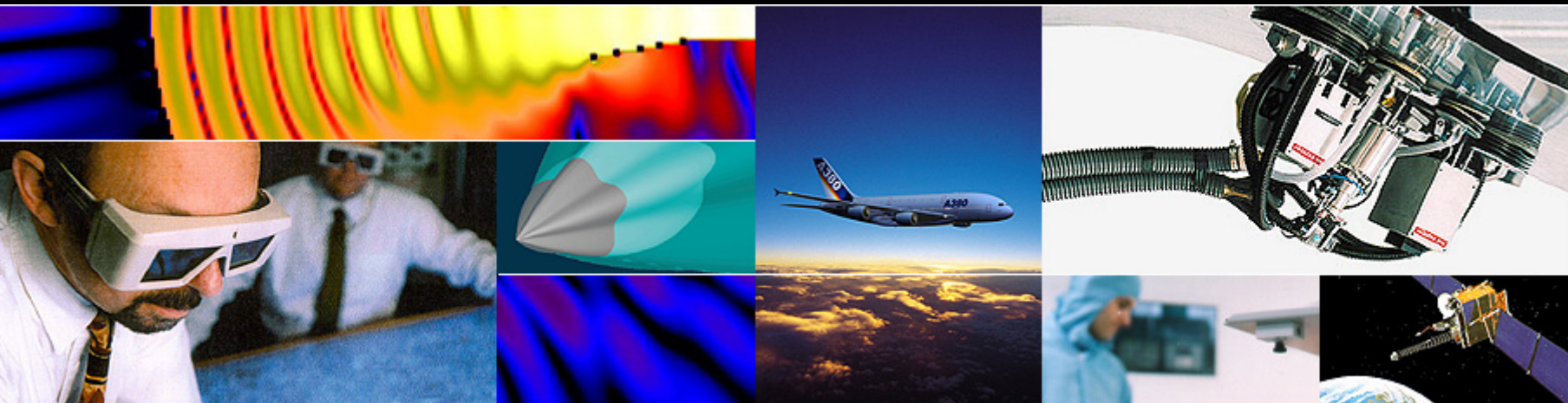
Challenges of SOA in collaborative Aerospace product development

OGF 23, Barcelona, June 2008

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Partners Involved

End users



Capability Providers



Grid Technologists



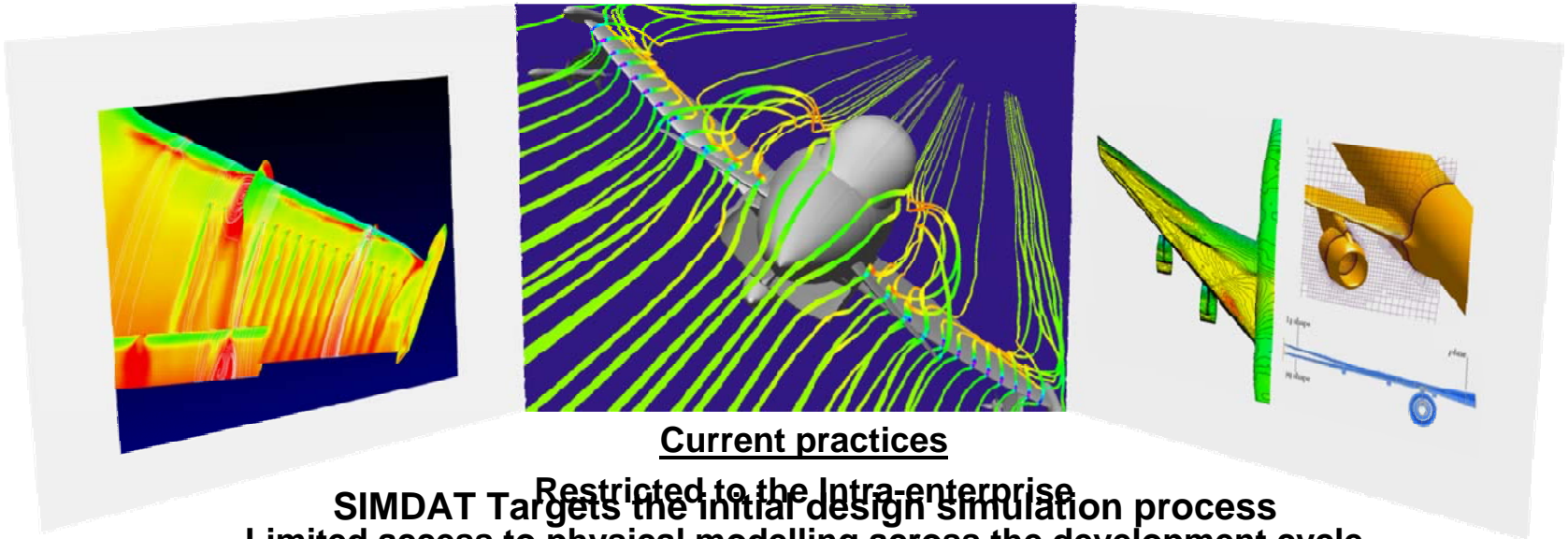
Why Grid?

Collaborative design is common in the Aerospace industry

How can we take advantage in advances in information technology to improve the design process?

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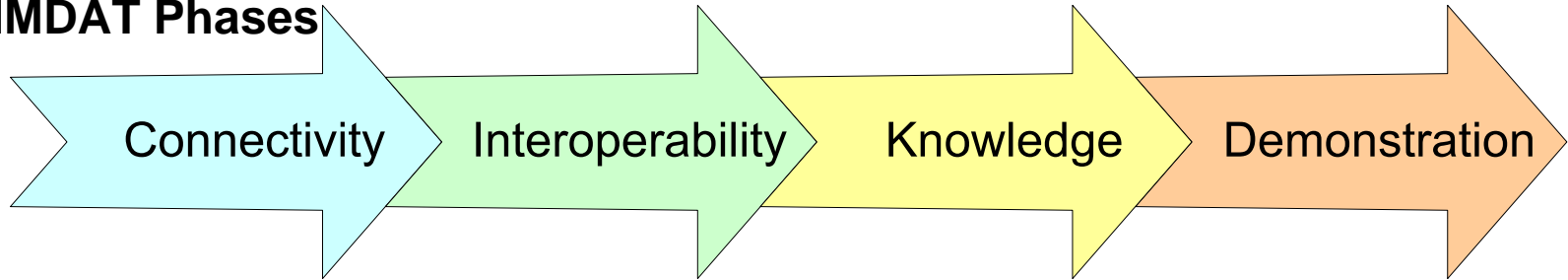




Current practices

- Restricted to the Intra-enterprise
- SIMDAT Targets the initial design simulation process
- Limited access to physical modelling across the development cycle
- Aims to reduce risk associated with configuration design decisions
- High cost associated with physical modelling
- By rapid and dependable access to high-fidelity analysis data
- Limited resource and data sharing between organisational units
- and the associated information and knowledge
- Lack of process knowledge capture and re-use
- Specialist users required to operate and maintain processes
- Inflexible typically non-portable process workflow implementations

SIMDAT Phases



How to connect the organizations?

All organizations have their own tools, how can we use grid but

Can we take the SIMDAT technologies and apply them to other industrial problems?

Demonstrate how technology can be exploited by industrial partners.

Go beyond the scope of the original use case.

Deploy SIMDAT on corporate resources

Original Use Case

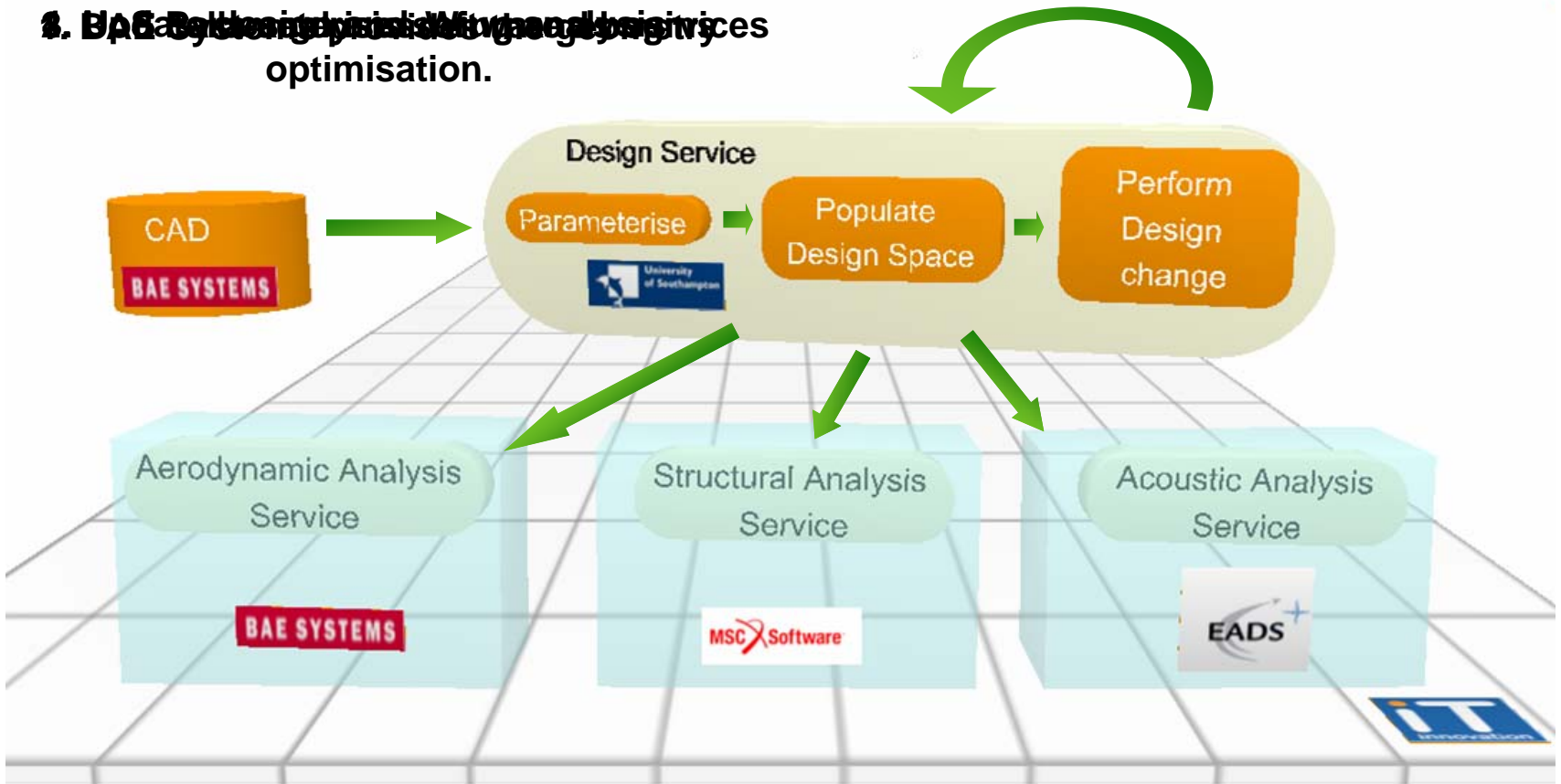
BAE 146



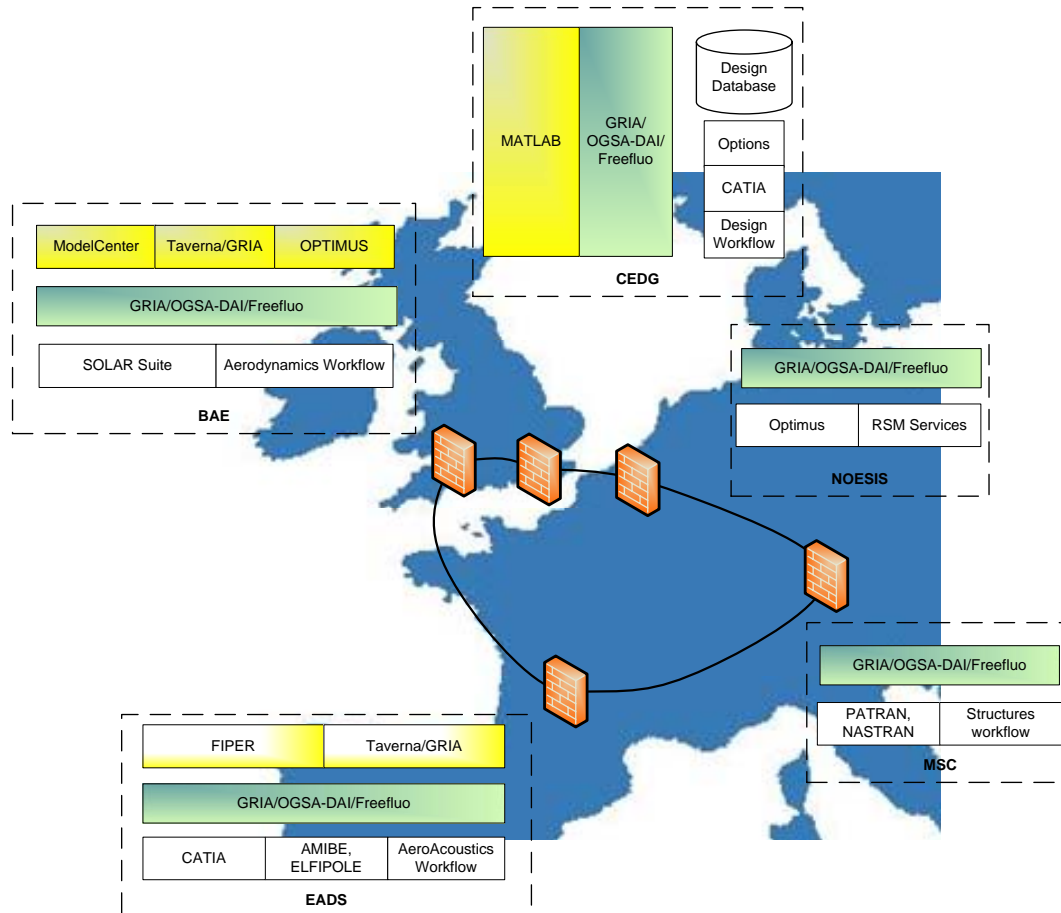
Noise during flap deployment

Use Multidisciplinary design optimisation to try and reduce noise while retaining flight characteristics

1. BAE Systems provides Wing analysis services optimisation.

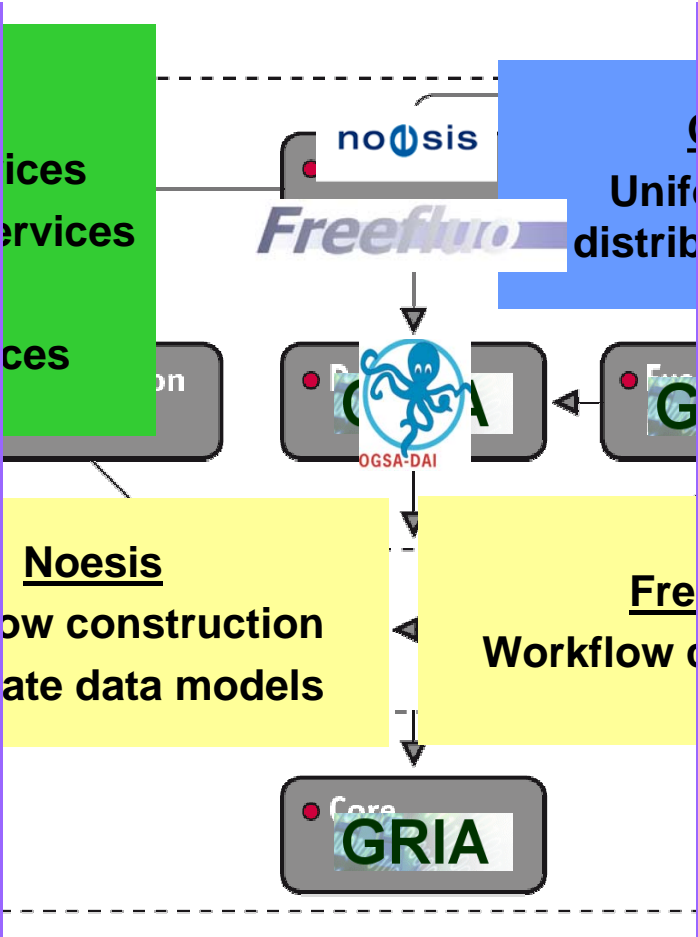


Deployment



Problem Solving Environments

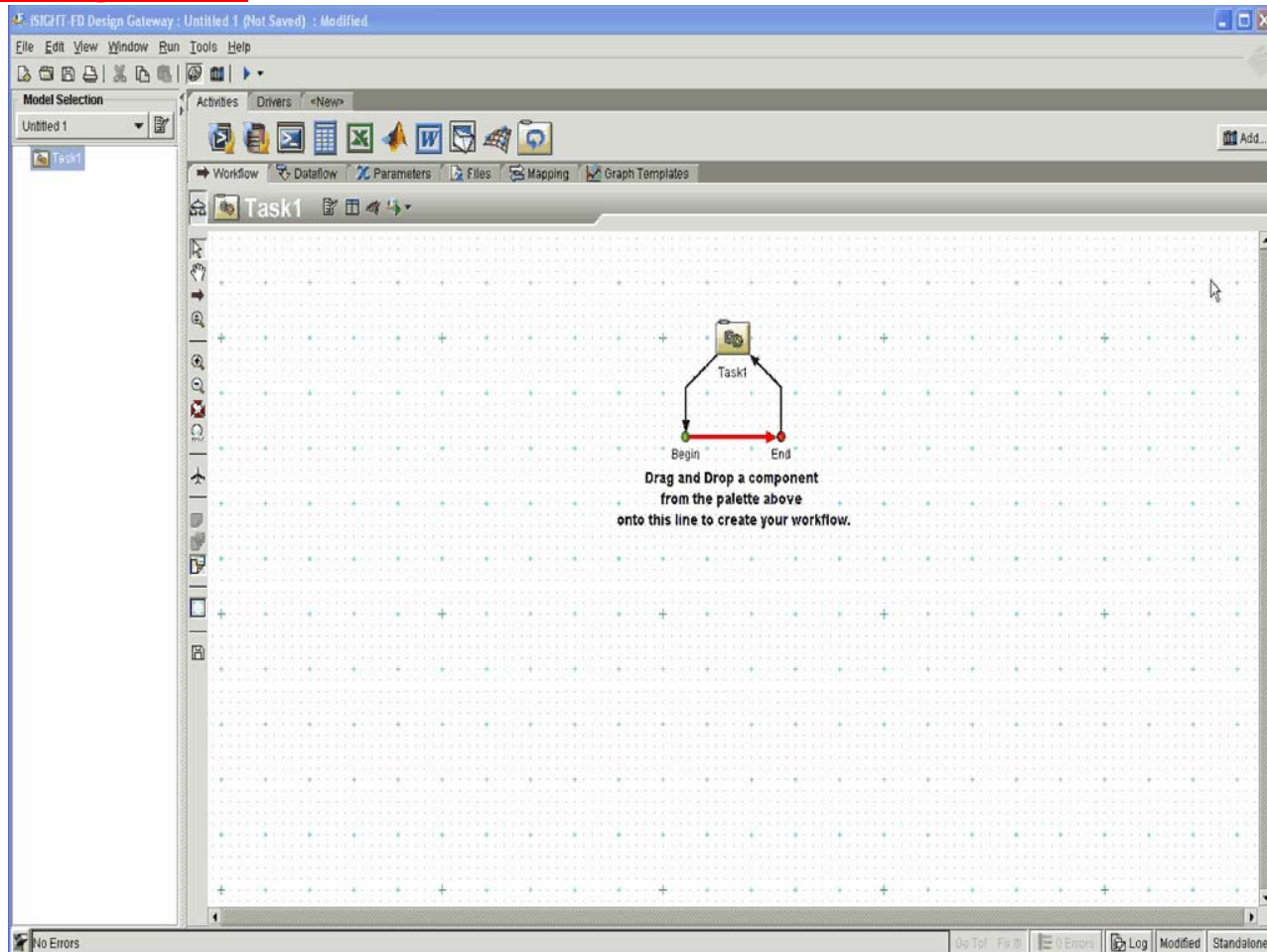
- Taverna
- ModelCenter
- iSight-FD
- Matlab
- Optimus



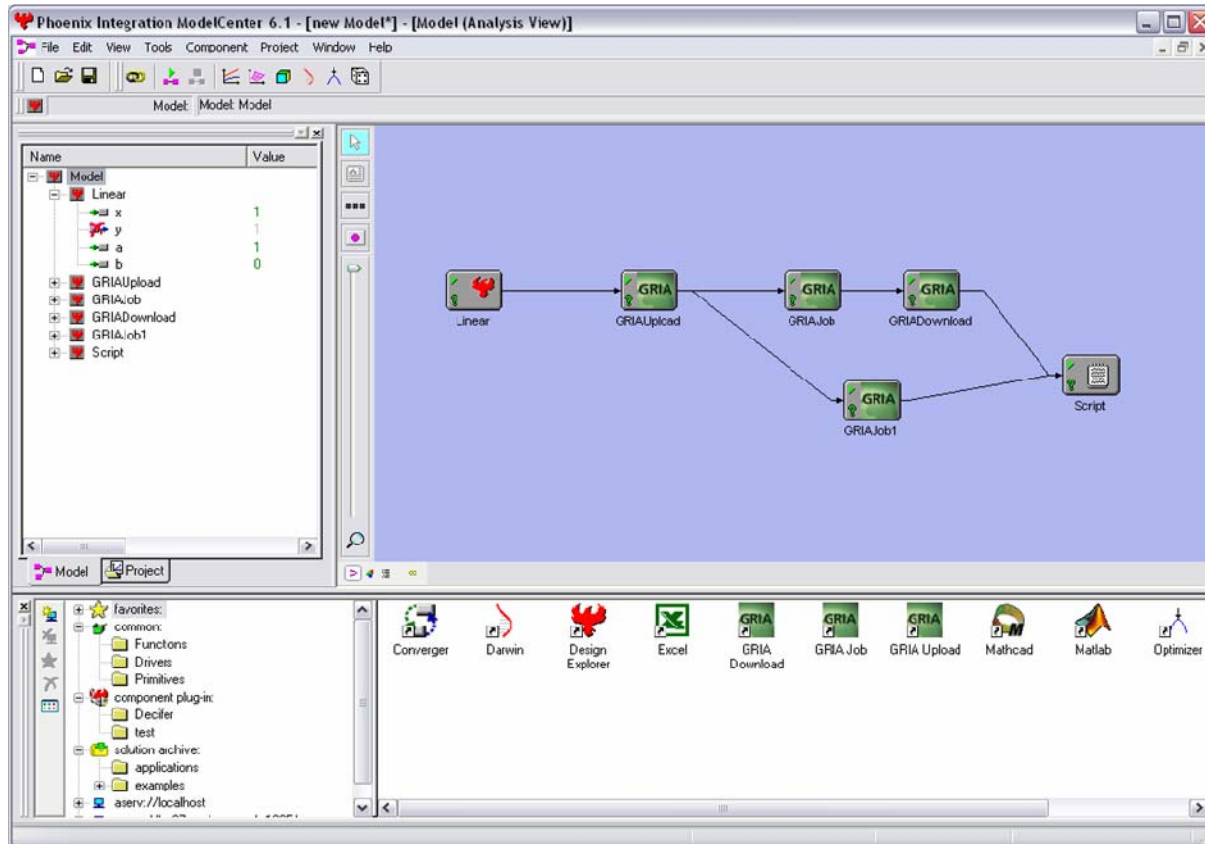
Analysis Services

- CFD**
 - SOLAR
 - Flite3D
- Acoustics**
 - Amibe, Actipol,
 - Anadel and Proche
- Structures**
 - Nastran
- Design and Optimisation**
 - OPTIONS
 - CATIA
 - Noesis
 - Decifer

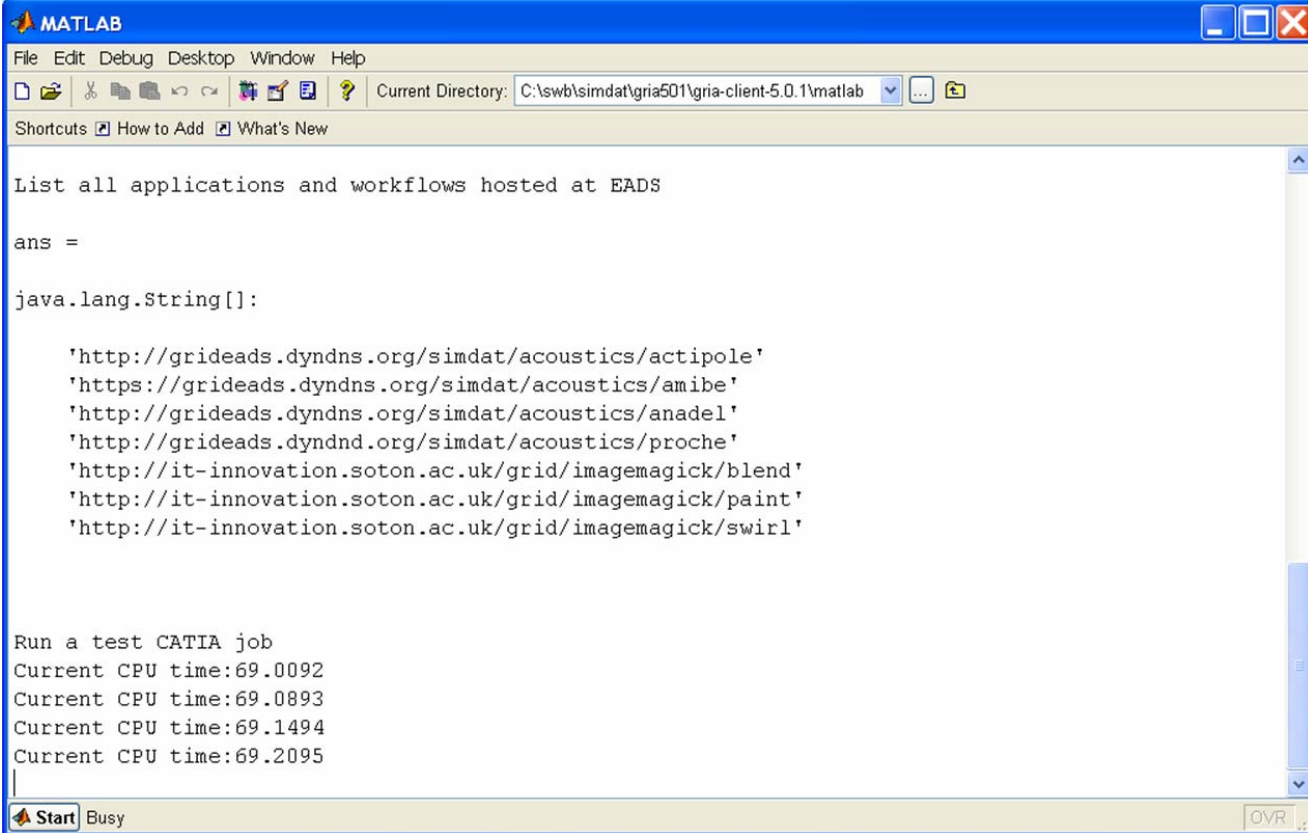
COTS Integration



COTS Integration – ModelCentre



COTS Integration – MatLab



The image shows a MATLAB window with a blue title bar and a menu bar (File, Edit, Debug, Desktop, Window, Help). The current directory is C:\swb\simdat\gria501\gria-client-5.0.1\matlab. The command window contains the following text:

```
List all applications and workflows hosted at EADS

ans =

java.lang.String[]:

    'http://grideads.dyndns.org/simdat/acoustics/actipole'
    'https://grideads.dyndns.org/simdat/acoustics/amibe'
    'http://grideads.dyndns.org/simdat/acoustics/anadel'
    'http://grideads.dyndnd.org/simdat/acoustics/proche'
    'http://it-innovation.soton.ac.uk/grid/imagemagick/blend'
    'http://it-innovation.soton.ac.uk/grid/imagemagick/paint'
    'http://it-innovation.soton.ac.uk/grid/imagemagick/swirl'

Run a test CATIA job
Current CPU time:69.0092
Current CPU time:69.0893
Current CPU time:69.1494
Current CPU time:69.2095
```

So...

Intra-enterprise Grids can be done.

Inter-enterprise Grids are trickier....

SIMDAT has demonstrated that it can be done with today's technology and so what's stopping us?

Barriers to adoption (1)

Audit

- How is audit data stored and transported in a Grid system.
- Key for provenance and non-repudiation and demonstrating compliance to regulations.

Enterprise Identity scheme integration

- Expense of running a parallel PKI scheme.
- Identity schemes already exist.
- Grid technology will have to integrate into the enterprise environment.

Barriers to adoption (2)

Manageability

- Ease of configuration, administration and operational management
- Management of resources, applications/services and of SLAs/Policies.

Grid licensing models

- Integrate existing license management solutions.
- Devise new licensing models more appropriate for Grids based on traditional business models.
- New models for emerging disruptive business models.

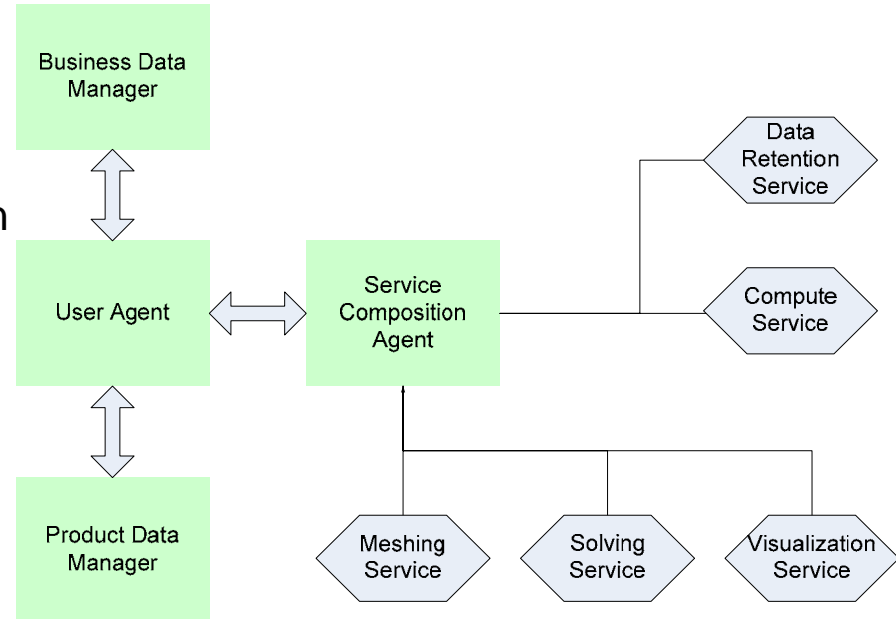
Enterprise Accreditation

- Can the Grid model be accredited for use with the aerospace industry?

Accreditation Case Study

Lightning Strike Analysis (LSA)

- Contributes to type certification
- Uses HPC
- Analysis has to be rerun following design changes
- Information contributing to type certification must be kept for the lifetime of the aircraft
- Serious implication in case of accident, use in resulting legal action.



Business reasons for accreditation

- Regulations require high standards, safety implications of failure severe.
- Prime contractor does not check every component, rely on accredited suppliers as proving airworthy components. Prime then checks their accreditation.
- Software subject to same testing and validation.

Life Cycle Management

Quality accreditation (EN9100)

Security accreditation (SABSA Model)

Data retention (OAIS, LOTAR)

Evidential requirements

Audit requirements

Service Providers

Services need to be available/re-creatable for 40-70 Years!!

Is this a viable business model for ISVs?

What guarantees does the client need?

Does virtualisation of the services help?

How do we describe services and (try to) insure compatibility?

Delay caused to the A380 by incompatible design software is quoted as having cost Airbus four to five billion Euros.

Is it worth it?

So where else could we use Grid in Aerospace?

Virtual Test Beds

- Large systems integration tasks with multiple subcontracts, deploy distributed virtual test bed for component testing.

Supply chain integration/ Virtual Engineering

- Allowing SME's access to the Primes tools and process to increase the speed, ease and reduce the cost of collaboration.

Controlled data sharing in multi-organisational collaborations.

Internal access to resources and capability, CFD Portal.

CFD Portal

Problem

The ATC has a CFD capability based on in-house tools that may offer an alternative to expensive COTS tools.

BU's might not have the time or resources to invest in installation, maintenance and learning new tools but want to evaluate capability.

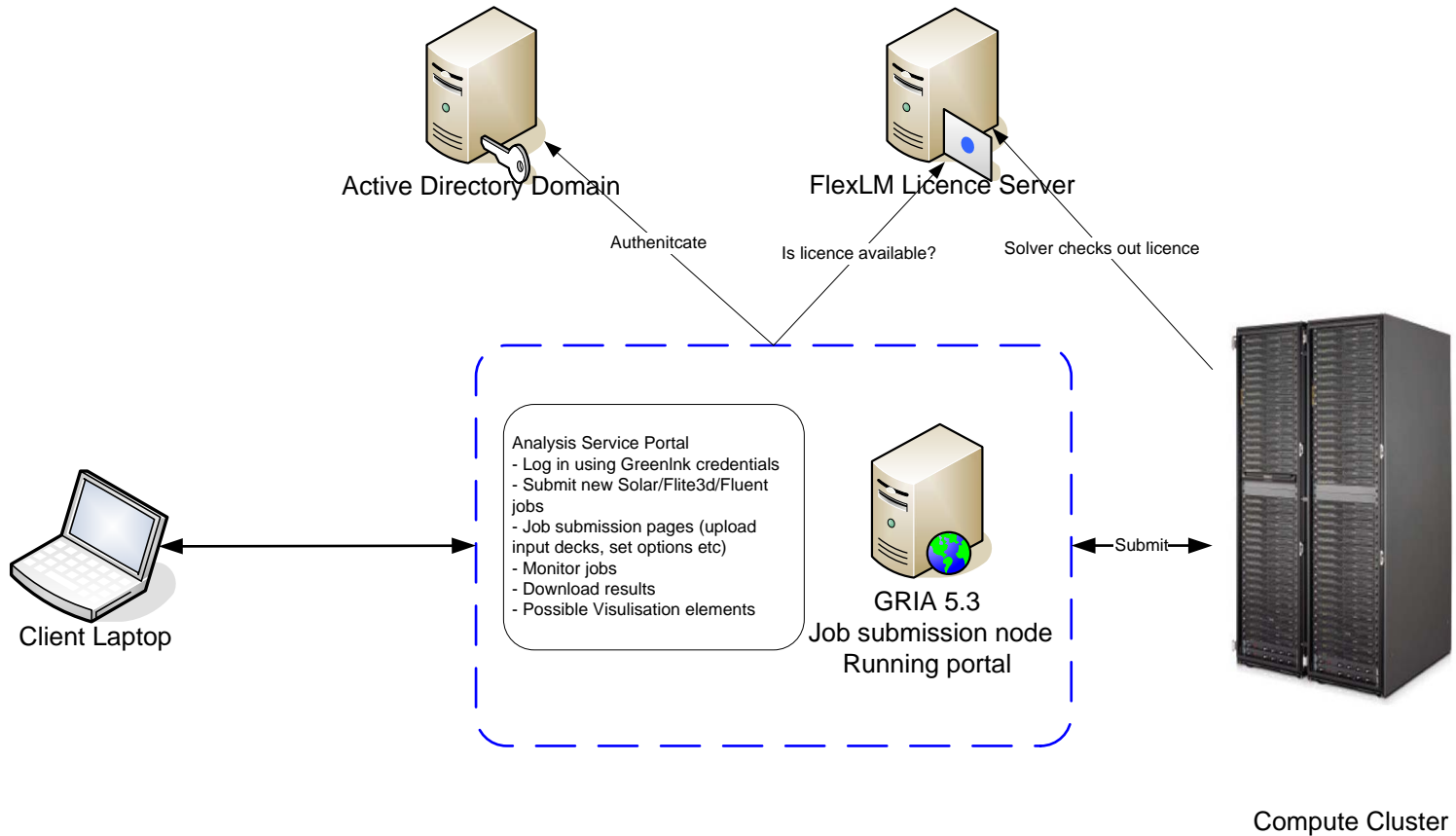
Question

Can SIMDAT technologies be used to provide a controlled interface to ATC's capabilities, Hardware, Software and Expertise?

Prove SIMDAT technologies can be integrated into enterprise computing environment.

Minimise specialised infrastructure setup.

Demonstration Phase Internal Usage Scenario



Conclusions

- Three Phases of SIMDAT very successful.
- Demonstrated three progressively refined prototypes.
- SIMDAT technology portfolio exploited for aerospace engineering applications.
- Now using Demonstration phase to show how technologies can be used within BAE and investigate new opportunities.
- Several barriers identified and some tackled within the project
- Accreditation still poses real issues for SOA in engineering