

## GOLD

### Grid-based Information Models to Support the Rapid Innovation of New High Value Added Chemicals

The UK chemical industry needs to improve its modest \$9 – \$12 billion share of the \$250 billion global markets. Manufacturers focus on new product development as a means of growth, with time to market as the primary driver. Analysts state that more structured mechanisms for managing the innovation process must emerge if companies are to extract maximum profitability. Innovation must be placed in a context broader than traditional chemical R&D. New ways of working exploiting dynamic Virtual Organisational structures are needed. A recent SOCSA report on its mission to the US concluded that the UK chemicals sector faces an unprecedented challenge stemming from the convergence of existing technologies and from the aggressive implementation of new technologies in the US giving rise to new and highly agile competition. Those companies who choose to ignore key technologies including information and knowledge management will quickly fall behind US competitors in their ability to take process and product to market.

An increasing trend to service outsourcing in the chemical and other sectors creates a supply network of specialist, interacting companies providing services to each other. This concept of the Virtual Organisation has received much attention from the e-Science community.

Virtual Organisations in the real world, particularly in R&D contexts, are often highly dynamic. Processes, partners, services etc. might



change frequently throughout a project's lifecycle. For example, a chemical engineering project might discover a dangerous by-product part way through development. Properly handling this by-product may require mobilisation of specialised resources, creation of new processes and so forth. Similarly, it might be beneficial to delay deployment decisions (such as choice of manufacturer, QoS requirements or service details) until the last possible moment, to take advantage of dynamism in the project for efficiency purposes, or to mitigate the risks of upstream uncertainties.

### GOLD: Grid-Oriented Lifecycle Development

GOLD is a UK e-Science Programme Pilot project, funded by the EPSRC and industrial partners: Unisys, The Specialist Organic Chemicals Sector Association (SOCSA), The One North East Centre of Excellence for Process Innovation, Britest Ltd, The Foresight Centre for Process Analytics and Control Technology (CPACT) and the INSIGHT Faraday Partnership. It is a collaboration between the schools of Computing Science and Chemical Engineering and Advanced Materials at the University of Newcastle upon Tyne and Lancaster University Management School and is expected to start in October 2003. It is based around the development of Grid middleware to enable the construction and management of highly dynamic Virtual Organisations, addressing many of the practical problems such dynamic behaviour imposes. It will deliver an initial demonstration application in the Chemical Engineering sector, but all middleware developed will be generic and further demonstration applications in alternative sectors will be developed.

The project will focus on the following issues:

## Cultural and management implications of VO participation

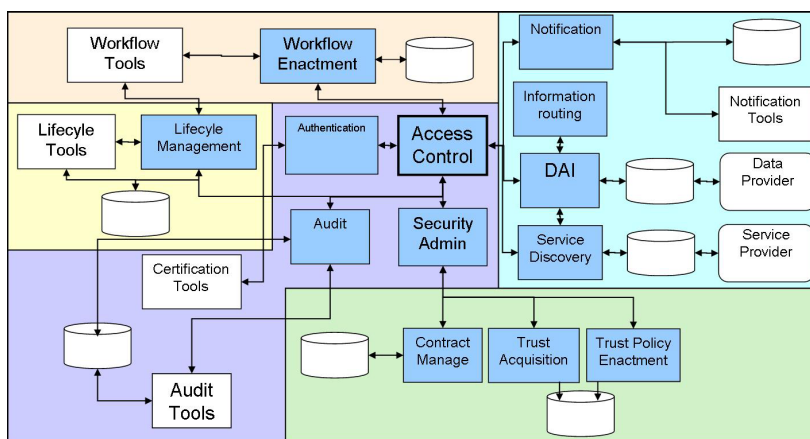
This workpackage will address cultural and organisational factors including how businesses without a history of previous cooperation might be encouraged to participate commercially in virtual organisations. It will determine technical and informational requirements for cooperative working and investigate how knowledge management may provide continuous assurance of business benefits delivery and promote business trust in a dynamic environment.

## Virtual Organisation management

Effective VOs (particularly highly dynamic ones) must be functionally highly-integrated and their resources able to interact strongly with the resources of other organisations. However, it is essential that participating organisations are not required to share technical, cultural and organisation infrastructure. In particular, software infrastructure requirements must be minimal as this would severely dynamic behaviour. To achieve this, a number of basic services must be abstracted from the application layer into middleware. GOLD will deliver these services.

## Trust management

Most business relationships are governed by lengthy contracts and experience of past relationships, which form the basis of trust in the resulting Virtual Organisation. Lengthy and time-consuming contracts are not appropriate in highly dynamic environments as they limit dynamic behaviour and increase setup time, so other means of establishing and managing trust are required. GOLD will develop services to enable the acquisition and management of trust relationships.



## Security management

Security is of particular concern in dynamic environments because of the transient nature of dynamic business relationships. In order to strongly integrate organisations without the need for excessive shared infrastructure, some task- or role-based access control mechanism is required to form the basis of resource interaction. GOLD will develop an access control service for the Grid, and investigate a number of other key Grid security concerns.

## Information management

Information management is paramount to successful projects. Where this information is distributed across a number of organisations, and particularly where the set of organisations is constantly changing, routing information to where it is needed can be difficult. GOLD will develop mechanisms for specifying information requirements and relevant notification/routing services.

## Demonstrator and integration

This workpackage will develop the middleware and tools specific to the Chemical Engineering demonstrator and will also investigate demonstrators in other industries. It will combine the development activities into three main integration points, which will coincide with the release of executable code.