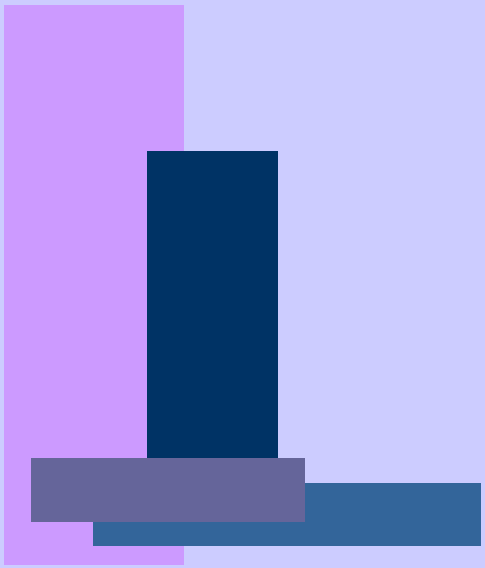
Dependable and commercially viable Grid middleware

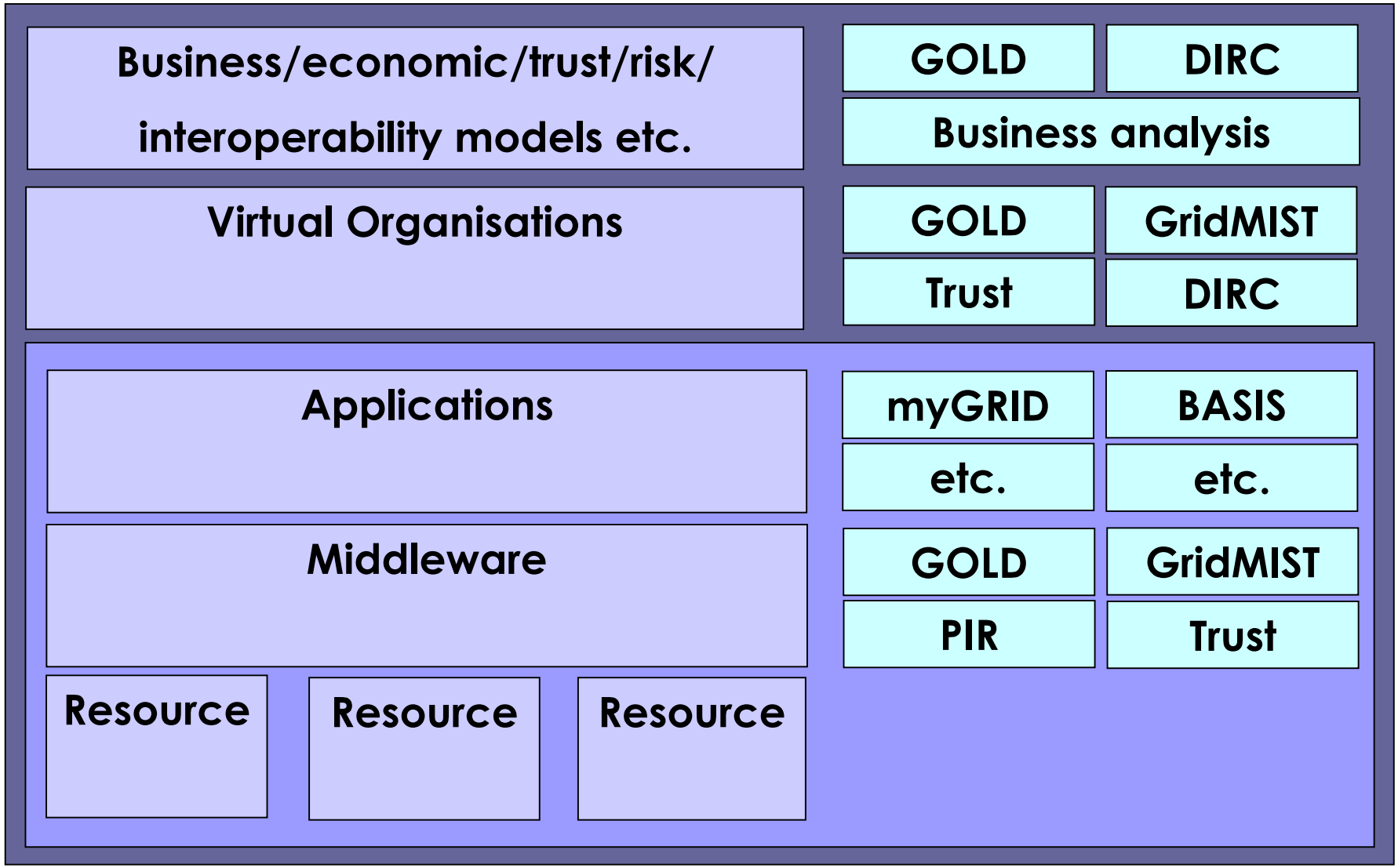


Rob Smith
Technical Director
North-East Regional e-Science Centre

Introduction

- Many e-Science activities promote the virtual organisation concept
  - Functional decomposition of businesses
  - Death of the traditional 'firm' concept
  - Growth of the 'knowledge economy'
  - etc.
- We probably don't give enough thought to **why**, **when** or **if** they are actually a good idea
  - Viability of new organisational models
  - Ability of Grid computing to deliver
  - Real and perceived risks
  - Validity of trust and security models
  - etc – are we building the **right** middleware? Are we addressing the **right** problems?
- We need to build dependable Grid middleware to support commercially viable virtual organisations
  - Practicalities of trust, security, dependability etc.
  - Commercial realities of deploying it
  - Potential impact on business and organisational models
- At Newcastle, we are bringing together psychologists, sociologists, business analysts and computer scientists to address these issues

Meeting in the middle



VO technological support

- Trust
  - Trust policies
  - Trust acquisition
  - Mutual trust
  - Trust maintenance
  - Audit, TTPs etc.
- Security
  - Dynamic, transient multi-party authentication
  - Decentralised yet coordinated security management (RBAC/TBAC)
  - Private information retrieval
- Dependability
  - Reliability
  - Fault-tolerance
  - Data/service replication
- Information management
  - Dynamic, transient business relationships
  - Decentralised yet coordinated information management
  - Active information sharing
- VO management
  - Dynamic, transient business relationships
  - Contract management and enforcement
  - Distributed coordination

VO procedural/protocol support

- Middleware alone insufficient – deployment issues include:
  - Trust
    - What is the **basis** on which organisations will trust each other?
    - What is the role of the individual in trust relationships?
    - How are trust relationships formed and maintained?
    - Is trust symmetric? Transitive? etc.
    - What trusted third parties are required?
  - Risk
    - What are the real and perceived risks of VO participation?
    - How do the risks prevent uptake of Grid technology? Or new business models?
    - What mechanisms can address these risks?
    - What are the tradeoffs between risk and flexibility/dynamism/manageability etc? How can these tradeoffs be stated? Can mitigation mechanisms be sufficiently flexible?
  - Interoperability
    - Crossing security/trust/risk domains
    - Automatic configuration to specified domains
    - **Standards**

Business-level VO support

- New business/organisational models
  - Required for efficient VO working
    - How do cost centres work?
    - Perception of fairness (cost, benefit, resource distribution)
    - Mitigation of risk
    - How can activity be coordinated in loosely-coupled VOs?
    - Trust infrastructure
  - As a consequence of VOs
    - Functional decomposition
    - New perception of value
    - New role for the individual (e.g. knowledge economy)
    - Highly dynamic relationships – extreme loose-coupling
    - Dynamic marketplace – firms have different identity/function depending on the VOs they participate in

- Certain types of organisational model have been proved (theoretically) more efficient than the traditional 'firm' concept
- Technology is required to support these models: Grid computing may be very appropriate for this
  - Standards-based
  - Focus on resource-sharing/collaboration
- The consequences of deploying these new business models may be very great

Work at Newcastle

- **GOLD** (new EPSRC e-Science Pilot Project)
- **MyGrid** (first round e-Science Pilot Project)
- **Trusted coordination in Dynamic Virtual Organisations** (EPSRC fundamentals of e-Science project)
- **DIRC** (Dependability Interdisciplinary Research Collaboration)
- **CoGRID** (FP6 proposal)

- Social Informatics Group – Informatics Institute
- School of Chemical and Process Engineering
- Business School
- School of Psychology

- A major theme for NEReSC
  - Leveraging existing projects/technology
  - Focus for new projects

Conclusions

- The e-Science community is doing a pretty good job of getting the lower levels right
  - Technology, standards etc.
  - Still plenty to be done
- Some activities addressing the VO level
  - Coordination of resources across VOs etc.
  - Still a **lot** of work to be done
- Very little activity at the business level
  - Motivation, viability, long-term requirements etc.
  - **Enormous** amounts of work to be done

- Computer Scientists probably shouldn't be leading this work – we need to get the experts in
- At Newcastle, we are starting to do this