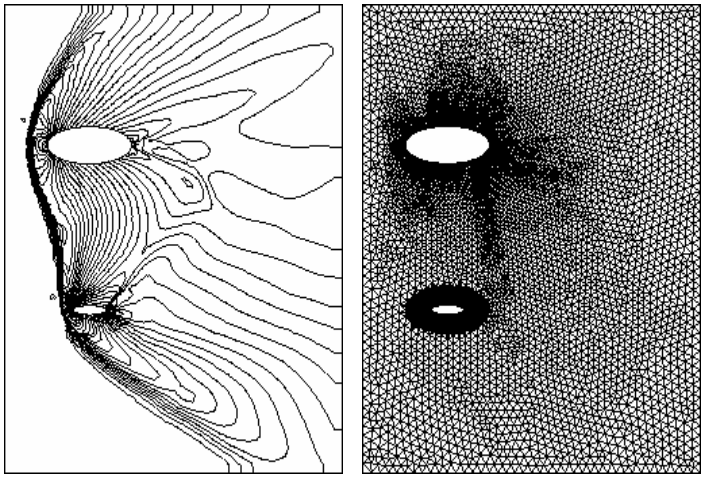
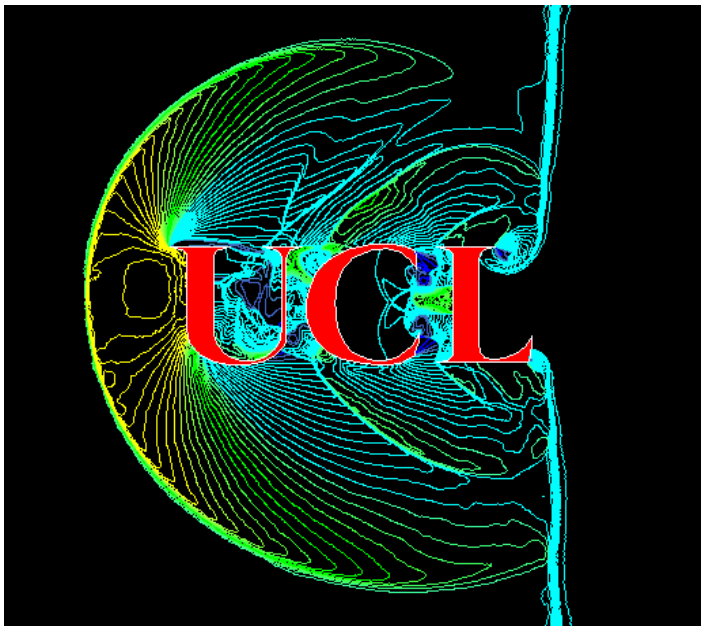
Steering applications with dynamic and self-organising behaviour





OGF Manchester
07th May, 2007
Amril, Hao & Soren
University College London

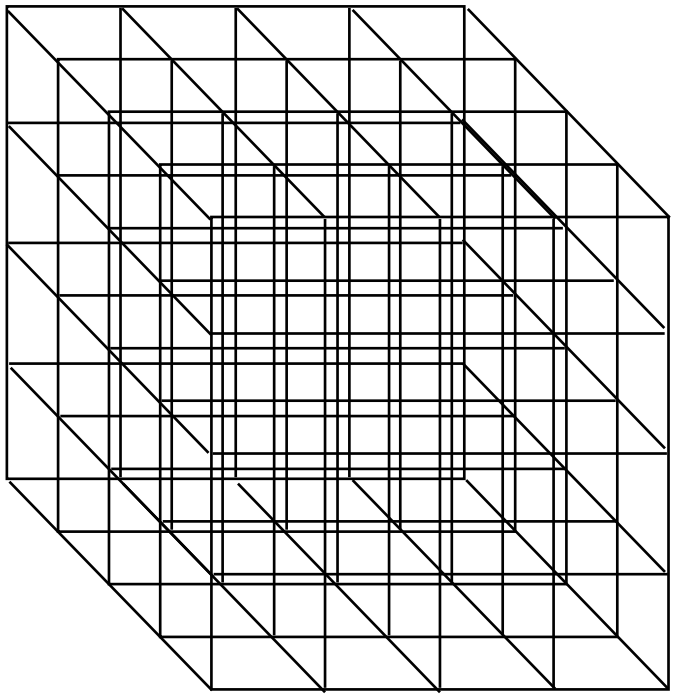
Talk Outline

- Goals – what we aim to achieve
- From Array-based Grid to Extended Automata Methodology (object graph)
- Supporting Infrastructure for Object-Oriented approach
- E-protein and RUNOUT Projects
- Conclusions

What we aim to achieve

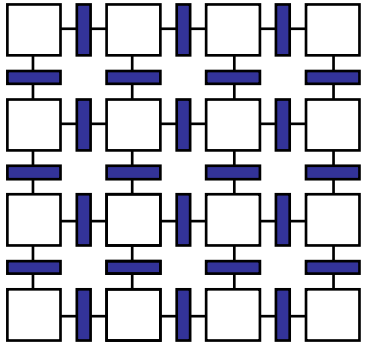
- A fully interactive simulation environment
- Enhance user-perceived simulation performance
- Immediate steering effect

Object Oriented Approach

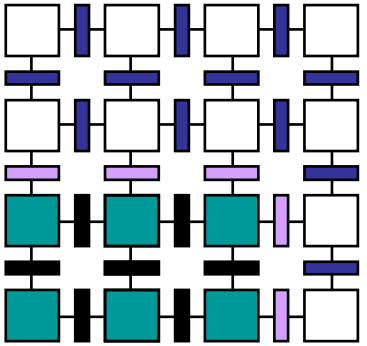


CFD Representation

V_{ijk} $V_{[200][120][120]}$

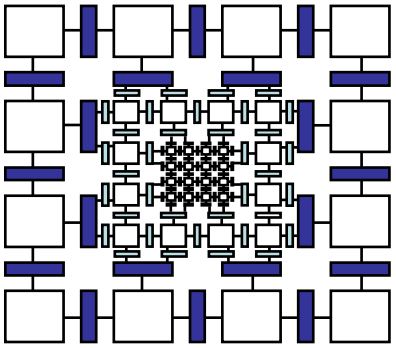


Both cells and cell walls are represented as objects

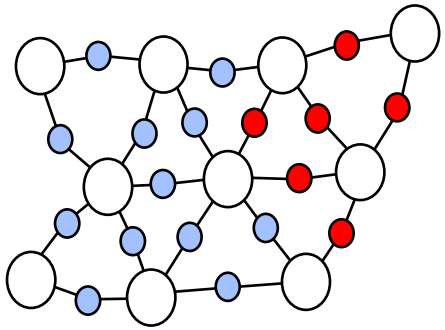


Cell Objects link by wall pointers (reference by addresses only)

Higher & Lower Res



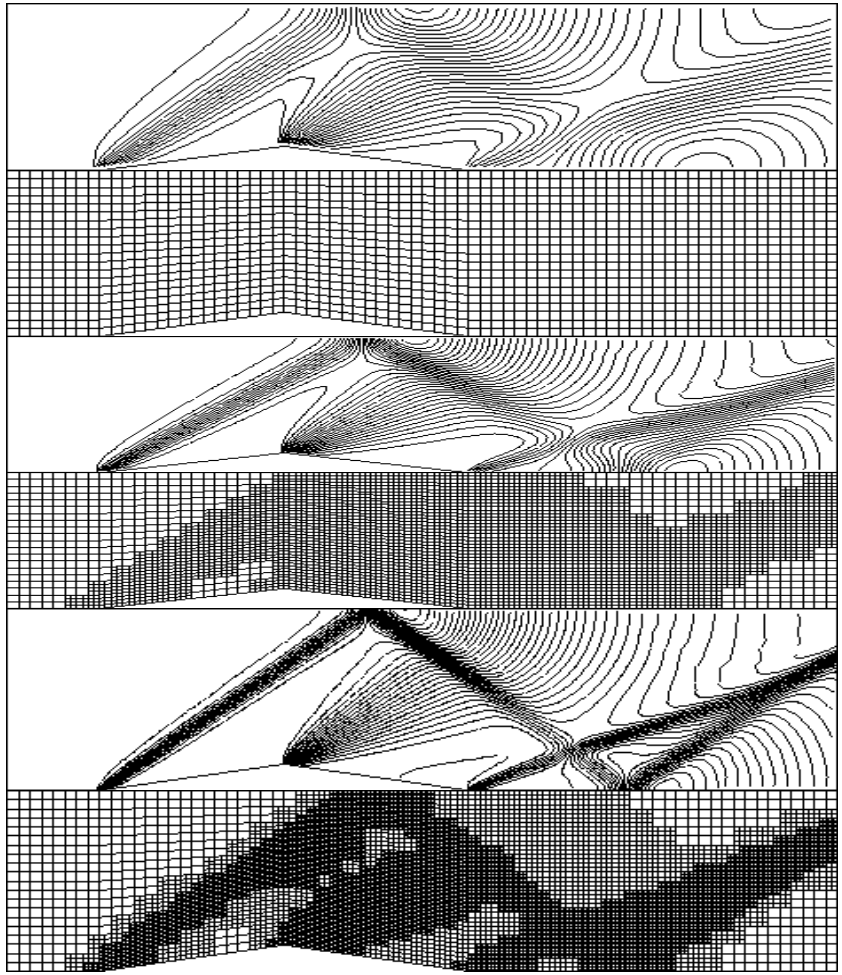
Physics Agent - local conditions
Object Agent – change resolutions
Transport Agent – optimal distribution

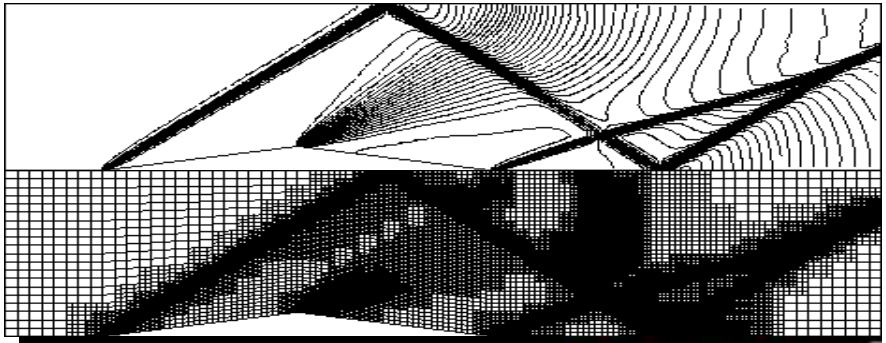


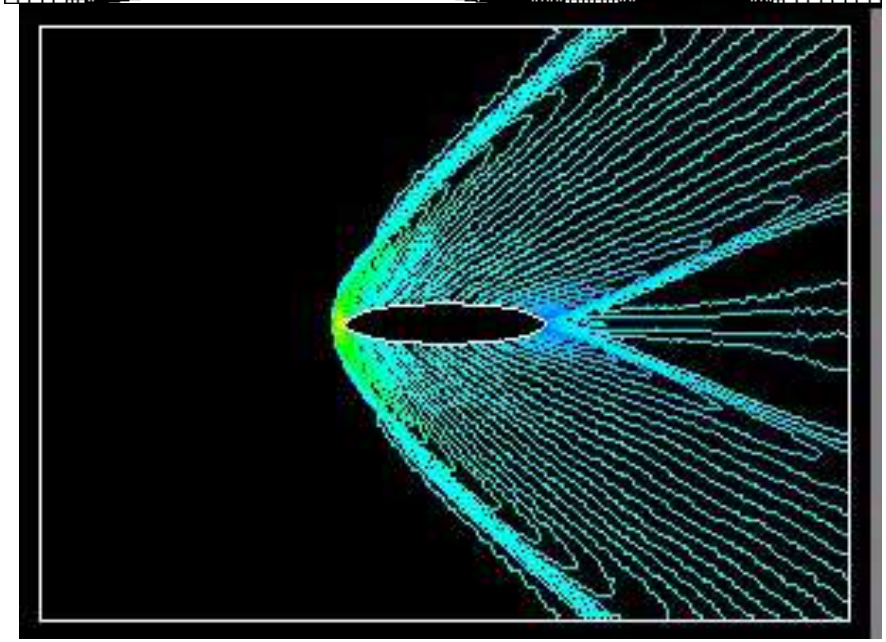
Mixed topologies of objects of different size–topologies change @ runtime

Constantly Changing

The grid structure is constantly changing@ run-time: Application has to organise the cells and needs to adapt dynamically



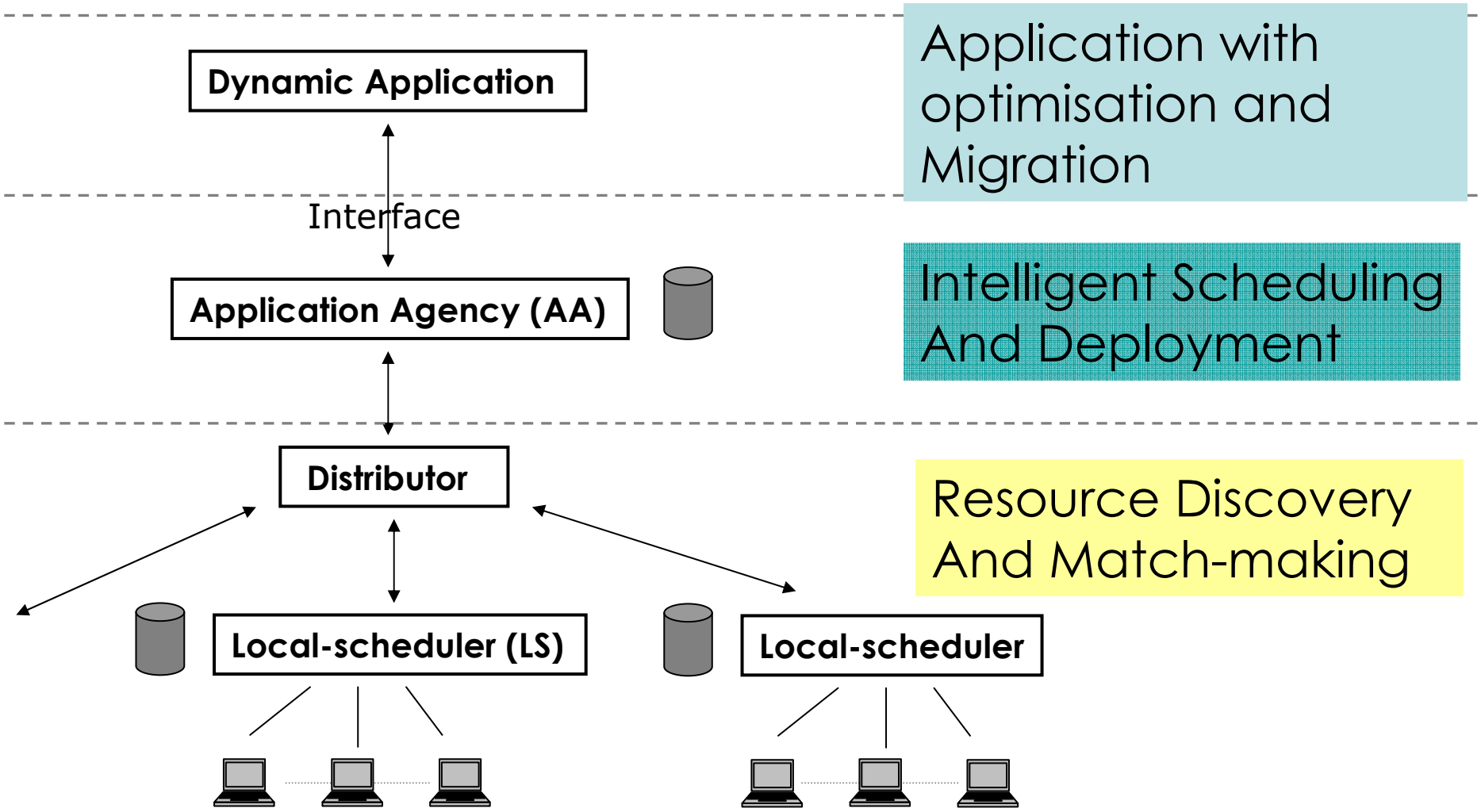




Supporting Infrastructure

- To maintain a smooth time progression, application performs load balancing with current resources.
- Application request more resources from **intelligent scheduler** (upper level)
- Generic Resource Management for all application types (Bottom level)

Infrastructure



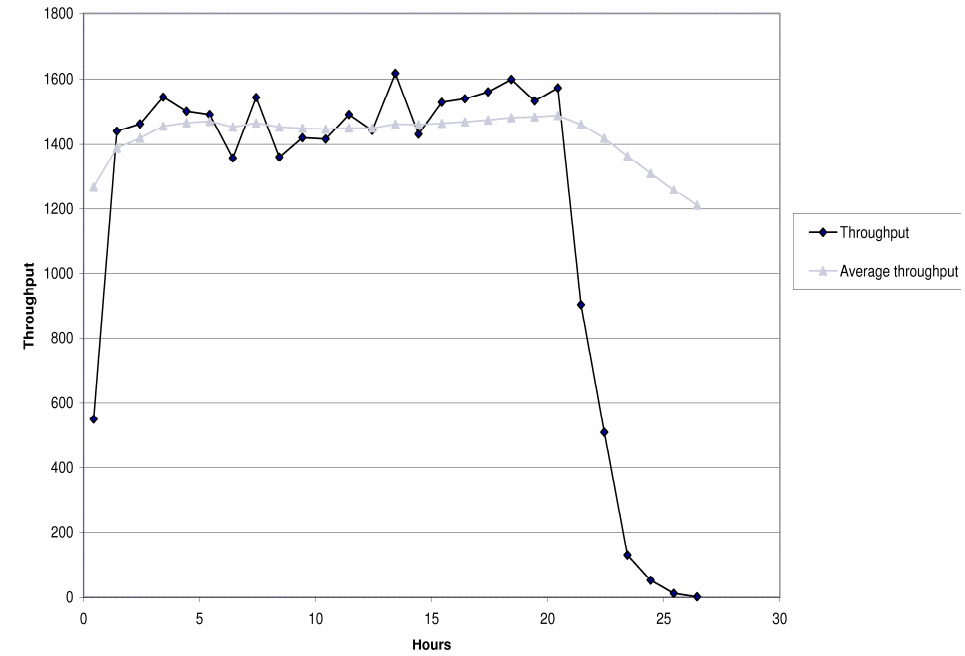
Resource Management

- Application Description (AD) is updated by application during steering process
- **AA** intelligently compiles the description received from the application into specific resource requests which are submitted to Distributor.
- Relying on the frequent information updates, Distributor quickly delegates requests to relevant LS.
- Detailed resource match-making done by **LS**.
- LS returns resource permits to AA

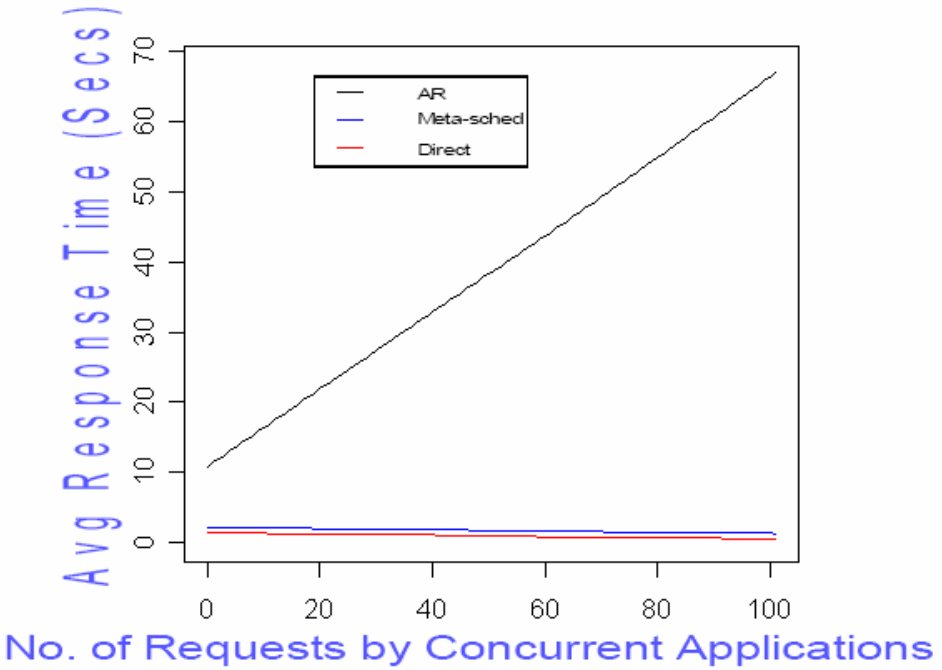
Maintain smooth time progression.

- AA performs resource request, resource deployment on behalf of application.
- Instantaneous and hierarchical allocation policy decreases the turnaround time
- Under fierce resource competitions, AA optimizes the allocation of resources amongst running applications according to **Resource Request Deadline (RRD)**
- AA automatically exchanges resources with other running applications to satisfy each application needs – to improve resource utilization

E-Protein & RUNOUT

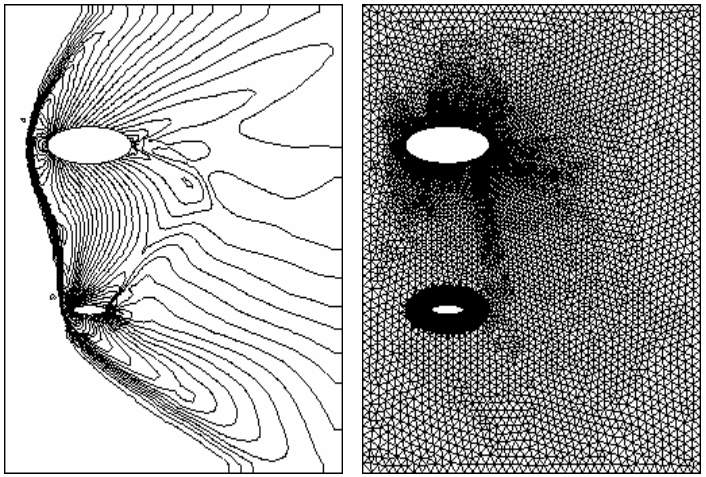


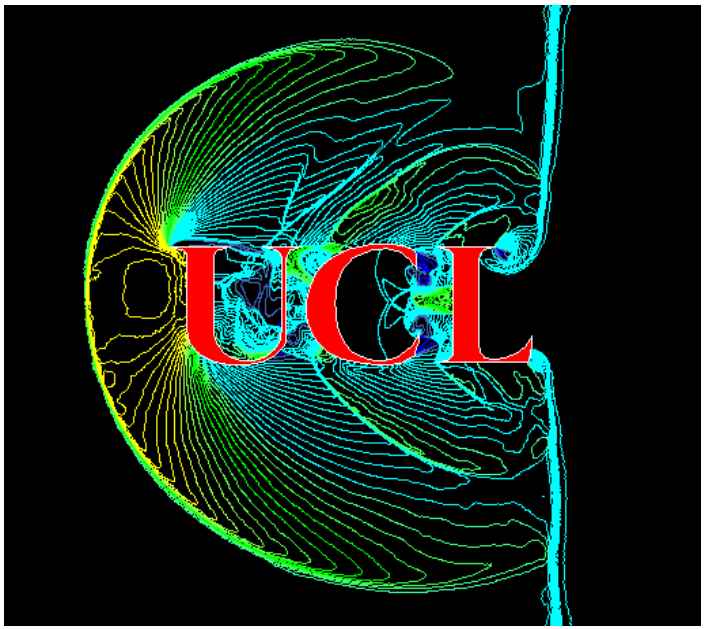
Liam McGuffin , Richard Smith , Kevin Bryson , Soren Sorensen , David Jones. High throughput profile-profile based fold recognition for the entire Human proteome. BMC Bioinformatics. 2006 Jun 7;7 (1):288 16759376



Amril Nazir, Hao Liu, Søren-Aksel Sørensen. On demand Resource Allocation Policies for Computational Steering Support in Grids. To appear in International Conference on High Performance Computing, Networking and Communication Systems 2007.

Steering applications with dynamic and self-organising behaviour





OGF Manchester
07th May, 2007
Amril, Hao & Soren
University College London