e-Science Core Programme

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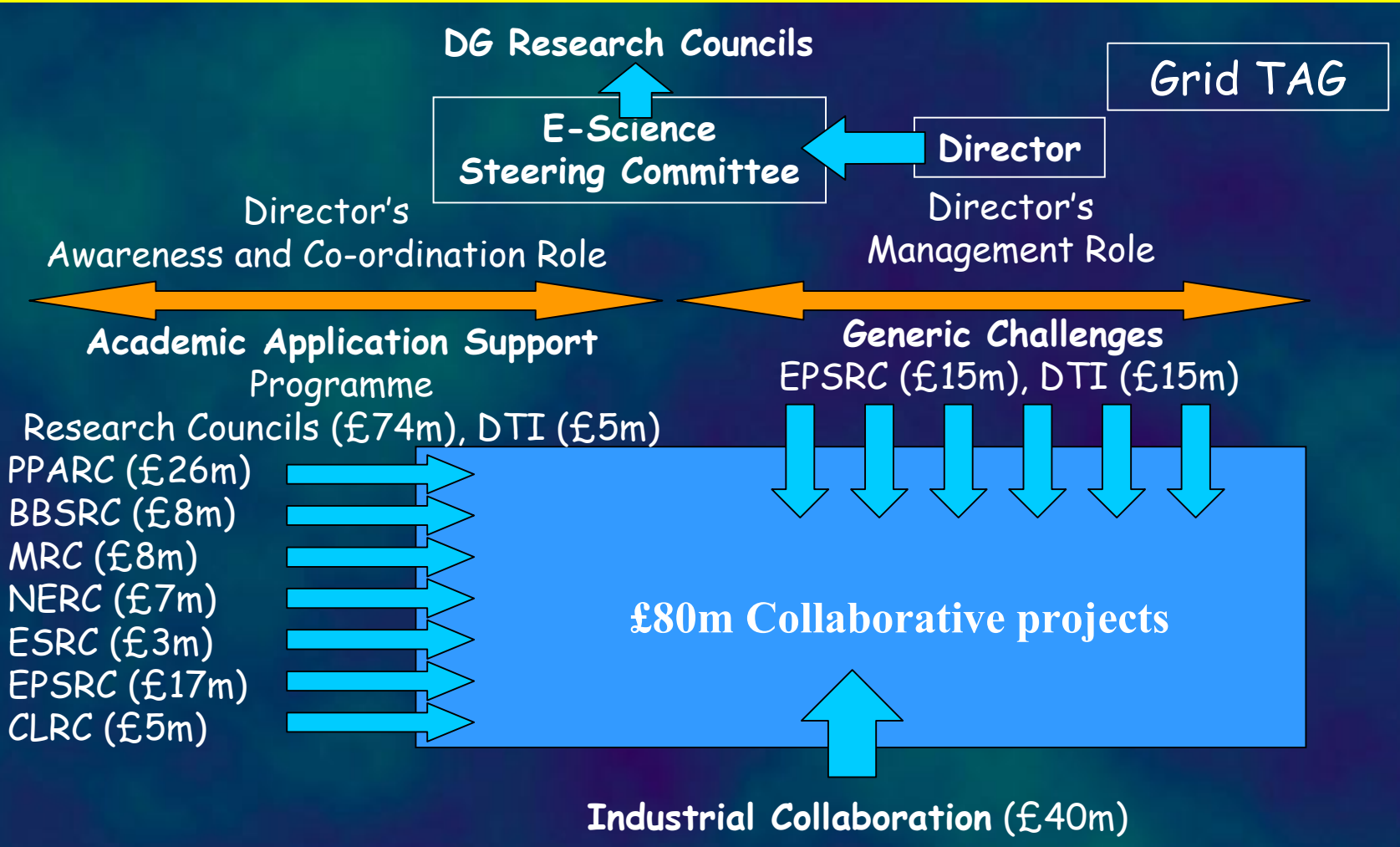
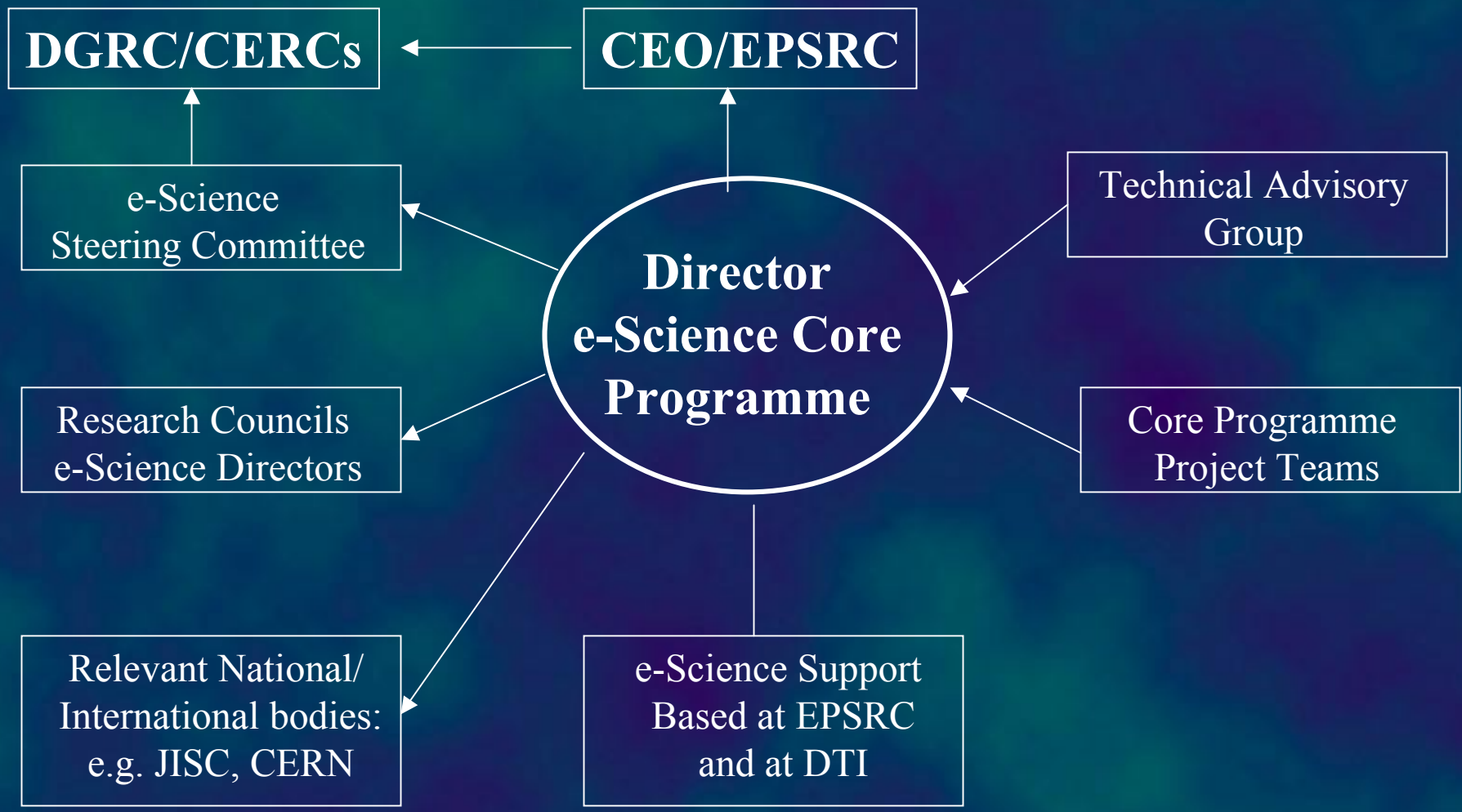
The e-Science Challenge

- £120M 3 Year Programme to create the next generation IT infrastructure to support e-Science and Business
- Essential that UK plays a leading role in Global Grid development with the USA and EU
- Phase 1 – Started roll out of plan for Grid Research, Development and Support of e-Science Testbeds
- Phase 2 – Longer term research goals, with greater outreach and dissemination

e-Science Programme



e-Science Programme

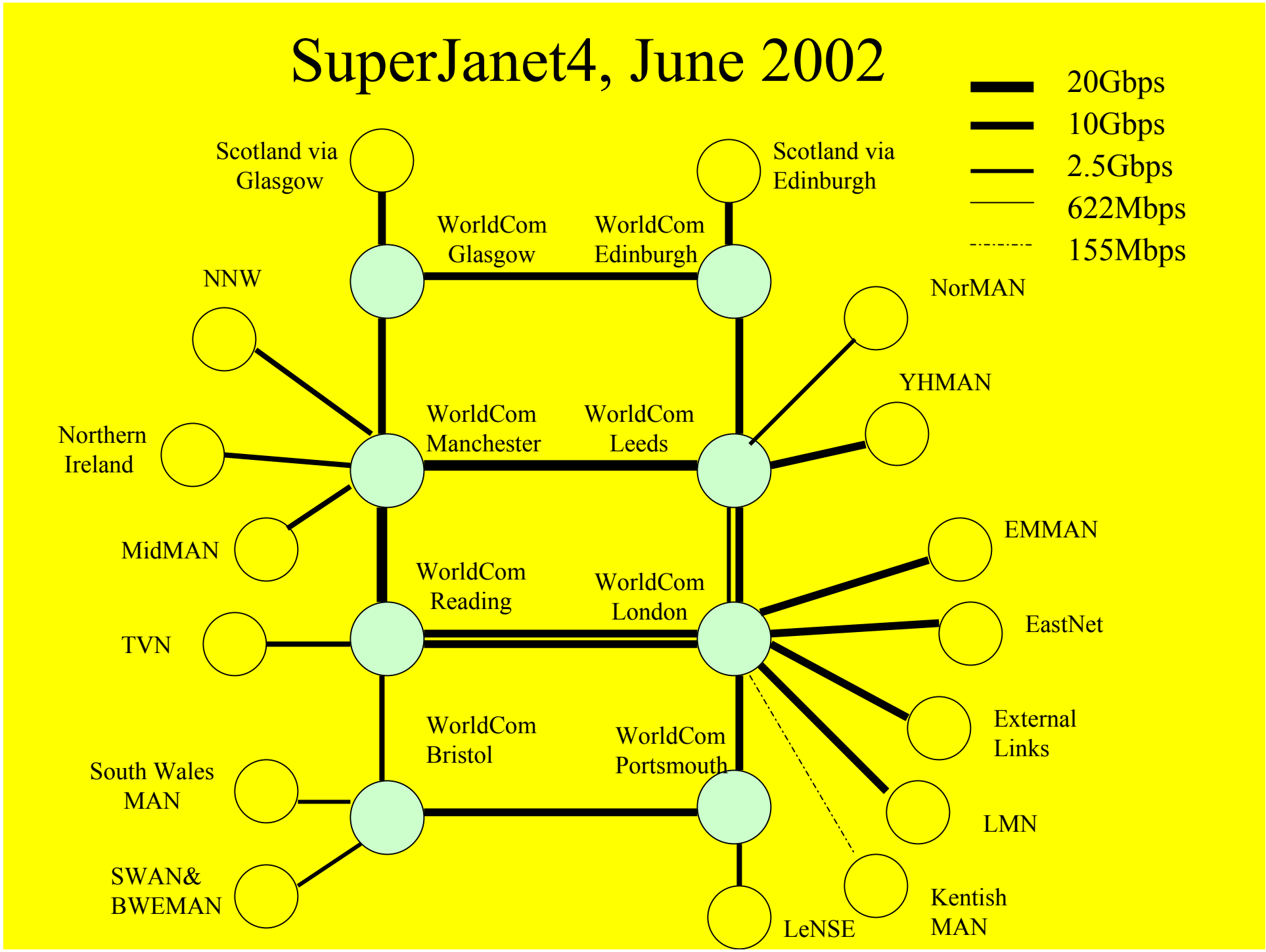


Excerpt from e-Science Director's job objectives

'Develop effective collaborative Core Programme projects between the science base, industry and national funding agencies, and ensure the application and outcomes from the projects.'

Backbone Infrastructure

- Based on SuperJANET4 Project run by UKERNA for JISC
- WorldCom providing national backbone for SJ4 from March 2001
- Initially 2.5Gbps rising to 20Gbps by June 2002
- Connections to universities via MANs at 2.5Gbps
- ‘Last mile’ problem – SRIF?


SuperJanet4, June 2002
20Gbps
10Gbps
2.5Gbps
622Mbps
155Mbps
Scotland via Glasgow
Scotland via Edinburgh
WorldCom Glasgow
WorldCom Edinburgh
NNW
NorMAN
YHMAN
Northern Ireland
WorldCom Manchester
WorldCom Leeds
MidMAN
EMMAN
WorldCom Reading
WorldCom London
TVN
EastNet
External Links
WorldCom Bristol
WorldCom Portsmouth
South Wales MAN
LMN
SWAN& BWEMAN
Kentish MAN
LeNSE

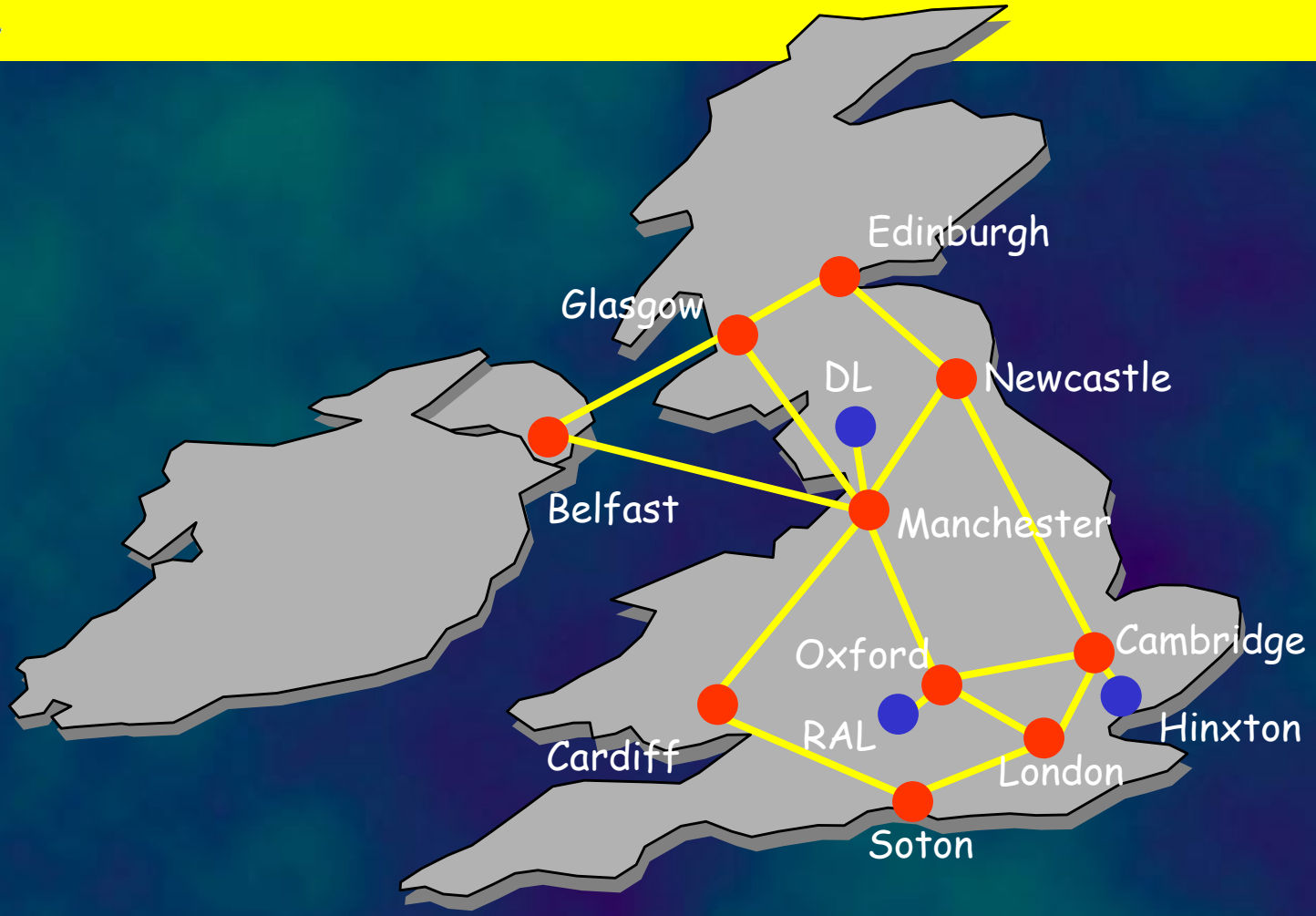
Key Elements of UK Grid Development Plan

1. Network of Grid Core Programme e-Science Centres
2. Development of Generic Grid Middleware
3. Grid IRC Grand Challenge Project
4. Support for e-Science Testbeds
5. International Involvement via GGF
6. Grid Network Team

Grid Core Programme Centres

- Establishing **National e-Science Centre** to achieve international visibility
- **National Centre** will host international e-Science seminars similar to Newton Institute
- Funding 8 **Regional e-Science Centres** to form coherent UK Grid
- Ensure matching industrial involvement using successful PAP funding model
- Good overlap with PP and AstroGrid Centres

U.K Grid Network



National e-Science Grid

National e-Science Centre: Edinburgh

- Cray T3E (344 PEs)
- SunFire 6800 (66 PEs)
- Beowulf Clusters

National HPC Centre: Manchester

- Cray T3E (816 PEs)
- SGI O3000 (256 PEs)
- SGI O2000 (128 PEs)

National e-Science Grid

Regional Centres

Belfast
- IBM SP2 (48 PEs)
- Intel Clusters

Cardiff
- Sun E6500 (44 PEs)
- ImmersaDesk

Cambridge
- HPCF Cluster
- Intel Clusters

Imperial College
- Fujitsu (84 PEs)
- Intel Cluster (800PEs)
- Condor Pool (200 PEs)

National e-Science Grid

Regional Centres

Newcastle

- Intel Cluster (24 PEs)
- VR Cave

Oxford

- IBM S/390
- SGI O2000 (72 PEs)

Southampton

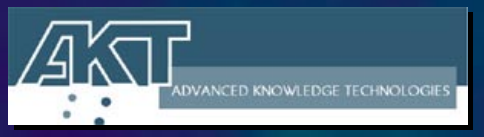
- Intel Cluster (324 PEs)
- Online Store (10TB)
- Robotic Tape Archive (20TB)

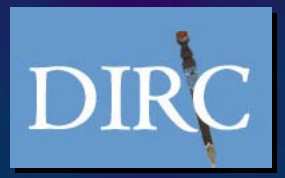
Generic Grid Middleware

- Encourage UK involvement in Global Grid Forum to develop Open Source/Open Standards for Grid
- Continuing dialogue with major industrial players – IBM, Microsoft, Oracle, Sun, HP ..
- Proactive and Open Call for Proposals from July 2001
- Call for CS involvement in EU DataGrid Middleware Work Packages (PP, Bio, EO)

Grid IRC Grand Challenge

- Equator: Technological innovation in physical and digital life
- AKT: Advanced Knowledge Technologies -
- DIRC: Dependability of Computer-Based Systems
- From Medical Images and Signals to Clinical Information





Support for e-Science

- 'Grid Starter Kit' Version 1.0 available for distribution today
  - joint funded with PPARC
- Setting up Grid Support Centre
  - joint funded with PPARC
- Training Courses
- National e-Science Centre Research Seminar Programme

Globus Layered Grid Architecture

- Application
- User – specialized user or application specific distributed services
- Collective – managing multiple resources, ubiquitous infrastructure services
- Resource – sharing single resources, negotiating access, controlling use
- Connectivity – talking to things securely
- Fabric – controlling things locally, access and control of resources

Storage Resource Broker

- SRB allows access through federated servers
  - file systems, databases, archival systems
- Collection-based data handling system
- Extensible collection attributes
- Extensible support for access to any type of storage system

International Involvement

- Funding ‘GridNet’ at National Centre for UK participation in the Global Grid Forum
- Funding CERN CS ‘Grid Fellowships’
- Paul Messina (Chair of GGF) agreed to take on International Liaison Role for UK Programme
- Participation/Leadership in EU Grid Activities
  - GEANT and TransAtlantic Terabit Testbed
  - New FP5 Grid Projects (DataTag, GRIP, …)
  - Development of FP6 Grid Programme

Grid Network Team

- Tasked with ensuring adequate end-to-end bandwidth for e-Science Projects
- Identify/fix network bottlenecks
- Network requirements of e-Science testbeds
- Supporting traffic engineering project with PPARC, UKERNA and CISCO
- Upgrading SJ4 connection to Hinxton site

e-Science Demonstrators?

- UK Access Grid Network
- Grid-Microscopy
- Robotic Grid-Astronomy
- CERN Test Beam
- Engineering/Science Visualisation
- Biodiversity
- Earth Observation
- Social Statistics Grid
- Medical Informatics

UK Grid Architecture and RoadMap

- Identify present strengths and weaknesses of Grid Starter Kit Software
- Develop Service-Oriented Grid Architecture
  - Client-Server, Web, P2P, …
- Interfaces to XML, SOAP, CORBA to connect Grid to Web Services and OMG worlds

➢ UK involvement in key areas of Global Grid Forum

EPSRC e-Science Projects

- Structure-Property Mapping: Combinatorial Chemistry
  - Southampton, Bristol
- DAME: Distributed Aircraft Maintenance Environment
  - York, Oxford, Sheffield, Leeds
- The Reality Grid: A Tool for Investigating Condensed Matter and Materials
  - QMW, Manchester, Edinburgh, IC, Loughborough, Oxford

EPSRC e-Science Projects

- My Grid: Personalised Extensible Environments for Data Intensive *in silico* Experiments in Biology
  - Manchester, EBI, Southampton, Nottingham, Newcastle, Sheffield
- GEODISE: Grid Enabled Optimisation and Design Search for Engineering
  - Southampton, Oxford, Manchester
- Discovery Net: High Throughput Sensing Applications
  - Imperial College

PPARC e-Science Projects

- GridPP
  - links to EU DataGrid, CERN LHC Computing Project, U.S. GriPhyN and PPGrid Projects
- AstroGrid
  - links to EU AVO and US NVO projects
- VISTA
  - under consideration

Role of e-Science Steering Committee

- Review all e-Science Projects
  - 6 EPSRC, 2/3 PPARC, …
- Annual e-Science Workshop
  - Presentations from GCP Centres
  - Presentations from Projects

Conclusion

- Good ‘buy-in’ from scientists and engineers
- Considerable industrial interest
- Reasonable ‘buy-in’ from good fraction of Computer Science community but not all
- Serious interest in Grids from IBM, HP and Sun
- UK will have most visible and focussed e-Science/Grid programme in Europe