

Models of Sustainability

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Oxford eResearch Centre

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■ e-Research

- e-Research is about global collaboration in key research areas, and the next generation of infrastructure that will enable it ([John Taylor](#))
- The invention and exploitation of advanced IT ([Tony Hey](#))
 - to generate, curate and analyse research data
 - to develop and explore models and simulations
 - to enable dynamic distributed virtual organisations



- Support for new capabilities and research practices underpinned by UK e-infrastructure services and/or service functions

National Vision: OSI – e-Infrastructure (2007)



www.nesc.ac.uk/documents/OSI/index.html

“A national e-infrastructure for research provides a vital foundation for the UK’s science base, supporting not only rapidly advancing technological developments, but also the increasing possibilities for knowledge transfer and the creation of wealth”

Overall Rationale: “to develop and broker **generic** technology solutions and **generic middleware** and to enable e-Science and form the basis for new commercial e-Business software”.

Through Four major functions:

- Assist development of essential, well-engineered, generic, Grid middleware usable by both e-scientists and industry
- Provide necessary infrastructure support for UK e-Science Research Council projects
- Collaborate with the international e-Science and Grid communities
- Work with UK industry to develop industrial-strength Grid middleware

- **JISC e-Research Vision: To develop a coherent UK e-Research infrastructure** in collaboration with the Research Councils and other relevant organisations which will:
 - provide the infrastructure and tools to allow research communities to create multidisciplinary research environments and to facilitate research collaboration within and between institutions
 - provide a robust, trustworthy, secure, interoperable and scalable infrastructure for the transmission, storage, sharing, accessibility and dissemination of research data and outputs
 - provide robust sustainable central services supporting the processes of research and which facilitate high quality research

JISC already provides the research community with:

- (i) Physical network to support research – SuperJANET5, UKLight and a *new dark fibre testbed* for photonics research, to inform SuperJanet6
- (ii) Access Management for researchers – the UK Access Management Federation meets the needs of most researchers, but JISC recognises the *specialised requirements of Grid/e-Science community* and is funding pilot projects to enable seamless inter-working between Grid and JISC's information environment
- (iii) Research content through JISC Collections and the infrastructure to access and manage that content through the Information Environment
- (iv) Development of Virtual Research Environments and Technologies combining access to research resources, research tools and collaborative tools
- (v) Capture of technical good practice and standards through the International e-Framework Initiative
- (vi) Advice and guidance through initiatives such as the *Digital Curation Centre and the National Centre for Text Mining*
- (vii) Monitoring and advising on open development strategies - both business and community-led - through OSS Watch

JISC e-Infrastructure Programme: Expanding the Uptake

- Build upon the initial five year investment in the UK e-Science Infrastructure.

- Work with other partners to expand the uptake and effective use of e-infrastructure from early adopters and researchers across disciplines.

- Two desired outcomes:
 1. To have enhanced and consolidated the current technologies.
 2. To have established sustainable communities of use.

Users to get common access to tools, data, information and nationally supported services



Delivered through “middleware”



- Much of the complexity and cost of building networked applications can be alleviated by the use of highly flexible, efficient, dependable, and secure *middleware*
 - the software that lies between infrastructure and applications.
 - functions of middleware include authentication, authorization, and accounting systems; distributed file systems; Web portals and grid computing software
- The JISC Information Environment provides national middleware to enable resource disclosure, discovery, delivery and preservation.
- The middleware infrastructure should permit the routine sharing of any remote resources, as well as supporting effective collaboration between groups of scientists.
- More work to be done to evaluate where interoperability between grid and Information environment is necessary or desirable

- Middleware needs of disciplines can vary.
 - One set of disciplines may be actively engaged in developing new middleware tools E.g. which require complete access to and control over the middleware layer for development and testing.
 - Other disciplines might not develop new middleware, but may rely entirely on centrally supported middleware systems and services
 - Need to collaborate with these disciplines and learn to accommodate a wide range of support needs.
- Finding the best balance can depend on the characteristics of the discipline itself.
 - Archaeologists may need significant training and central support to build new metadata models for capturing and archiving field data.
 - Physicists may require an infrastructure to run scientific codes which has more straightforward workflows but significantly greater volumes of data

■ Finding the best balance

- To adopt and create common standards for middleware
- openness, security, privacy, and stability may be the most difficult step in building common middleware
- Support the wide spectrum of data volume and complexity
- Support research workflows and modelling
- Support for the application layer which relies on coordinated infrastructure and middleware layers; ie the “coal-face” for innovation & creative work.

Extending the UK e-Infrastructure – Sustainability

- Ensure *a continuation of the efforts* developed under the eScience Core Programme, and through initiatives funded by the JISC and RCUK
- Focus on *changing the culture* and social relations of computer science and the domain sciences
- *Reduce duplication* of effort while creating basic middleware services on which present and future inter- and multi-disciplinary research can rely.
- *Encourage sharing and discussion* of good and successful practice
- Open collaboration of researchers, developers, and resource providers to support the needs of the wider e-Research community.
- Discussion underway on remit of OSS Watch; potential for extension of role to integrate sustainability advice with projects from an early stage
- Engage broader sustainability agenda - HEFCE Shared Services

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- The current UK eResearch Infrastructure provides unique opportunities for world-level research, training, and for stimulating knowledge and technology transfer
 - BUT equally need to ensure that there are sustainable and resilient systems in place for capacity building and the means to achieve global usability for the benefit of local, national and international researchers