

JOINT INFORMATION SYSTEMS COMMITTEE

JISC Circular 04/06 : Appendix E

e-Infrastructure

Summary

E1. JISC invites proposals for e-Infrastructure projects to undertake work with areas summarised in the table below, which indicates where in this document further details can be found. Prior to the detailed descriptions of projects sought, paragraphs E1 to E27 outline the background to the current work, and give general expectations and information, which apply to all projects.

Call	Theme/context	Description	Funds	See
e-Research Community Engagement and Support				
I	Barriers to Take-Up of e-Infrastructure Services	A phased approach to identify barriers to take-up of a selection of 'e-infrastructure services' and to address these through research, user engagement, training and awareness-raising, and assessment.	Total funds around £350,000 1 project 2-year duration	E33 - E52
II	Support for Research: Tools & Standards	Projects to extend ICT support of the research community in the provision of advice about and consolidation of existing and burgeoning technical standards and e-infrastructure tools that are in development and used by the research community.	Total funds around £300,000 1 project 2-year duration	E53 - E66
III	Use Cases and Service Usage Models	Projects to better understand how the research community of users actually engage with e-infrastructure tools and technologies to solve or address specific research problems or processes.	Total funds around £300,000 1 project Up to 2-year duration	E67 - E79
e-Infrastructure Security				
IV	Federated Tools and Services	Projects covering the integration of Grid and Shibboleth and vice versa, developing and applying n-tier web service architectures and developing and applying n-tier web service architectures.	Total funds c. £975,000 c. 5 projects Up to 2-year duration	E90 - E94
V	Virtual Organisation Management Tools and Services	Projects to consolidate and review existing national and international developments on VOs (such as myVocs , Grouper and Signet and related initiatives such as eduGAIN) and take into account the potential of new developments and to produce demonstrators that take account of the new capabilities within SAML 2.0 and Shibboleth.	Total funds c. £525,000 c. 5 projects 2-year duration	E95 - E100
Knowledge Organisation and Semantic Services				

Call	Theme/context	Description	Funds	See
VI	Semantically Coordinating Resources and Services Across Registries	Course validation: projects to develop a system, using an existing business process management application, that supports the course validation process based on the COVARM reference model.	Total funds c. £500,000 c. 3 projects 2-year duration	E101 - E122
<p>Projects are eligible to bid for more than one call (eg Call II) or strand of call (eg Call IV b)). However, it is requested that each call or strand of call be addressed in a SEPARATE bid with appropriate references to the adjoining bid(s), identifying where there would be economies of scale and added value from addressing more than one call or strand of call.</p>				
<p>This appendix must be read in conjunction with the main body of JISC Circular 4/06 which can be found at: http://www.jisc.ac.uk/funding_circular04_06</p>				

Structure of this document:

Summary	1
General information relating to all projects	3
Background	3
Outcomes from the Programme	3
Introduction.....	4
Nature and scope of projects sought	4
General expectations	4
Technological approach to be employed	4
Structure of Proposals.....	6
Submission of Proposals.....	6
Further Information.....	6
Information on specific project areas: e-Research Community Engagement and Support	7
Call I - Barriers to Take-Up of e-Infrastructure Services	8
Call II – Support for Research: Tools & Standards	14
Call III - Use Cases and Service Usage Models	18
Information on specific project areas: e-Infrastructure Security.....	21
Call IV - Federated Tools and Services	23
Call V - Virtual Organisation Management Tools and Services	25
Information on specific project areas: Semantic Services and Knowledge Management	27
Call VI - Semantically Co-ordinating Resources and Services Across Registries	27
e-Infrastructure Proposal Coversheet	32

General information relating to all projects

Background

- E2. 'e-Infrastructure' is the term used for the distributed computing infrastructure that provides shared access to large data collections, advanced ICT tools for data analysis, large-scale computing resources and high-performance visualisation. It embraces networks, grids, data centres and collaborative environments, and can include supporting operations centres, service registries, single-sign on, certificate authorities, training and help-desk services. Developments in this field are already maturing, with grid computing now typically used as a basis for the computation and data management required by collaborative research, and virtual research environments and federated access management being adopted. Concurrently, a new set of common e-infrastructure functions is emerging, which in turn will enable higher level, innovative applications to be developed.
- E3. The JISC e-Infrastructure Programme builds on the work arising from the JSR (JISC Support of Research Committee),¹ the e-Science Core Programme,² and the OSI (Office of Science and Innovation) e-Infrastructure Roadmap initiative. It has also been informed by European and international developments within the grid and e-research communities.
- E4. The vision for the programme follows the initial five-year investment in the UK e-Science Infrastructure, which is being developed with other partners to expand the uptake and effective use of e-infrastructure from early adopters and researchers across disciplines. There are two elements to this:
1. To have enhanced and consolidated the current technologies;
 2. To have established sustainable communities of use.
- E5. The e-Infrastructure Programme is comprised of four thematic areas:
- A. *Community Engagement and Support* – Focusing on community engagement and support in the broader take-up and more effective use of e-infrastructure.
 - B. *e-Infrastructure Security* – Focusing on solutions to issues of grid authentication, authorisation, and interoperability of access management regimes between the e-Science Grid and the JISC Information Environment.
 - C. *Grid Services and Tools* – Building on the core UK grid for the production use of computational and data grid resources for a broader research community.
 - D. *Semantic and Knowledge Services* – Examining semantic web technologies, semantic aware services and protocols for the exchange of metadata.

Outcomes from the Programme

- E6. The anticipated outcomes of the programme are to ensure:
1. Broader and more effective use of the e-infrastructure;
 2. Enhanced security for the UK infrastructure;
 3. Increased capability, expertise and effective use of the National Grid Service;
 4. Production level capabilities for the UK e-infrastructure;
 5. New ways of retrieving and processing data, opening up new areas of research and expanding existing ones;
 6. Integration with other key initiatives, both within JISC and the wider research community.

¹ www.jisc.ac.uk/jcsr_home

² www.epsrc.ac.uk/ResearchFunding/Programmes/e-Science/default.htm

- E7. A more detailed overview of the e-Infrastructure Capital Programme, which outlines the work packages, outcomes and all the intended benefits, is available from: www.jisc.ac.uk/index.cfm?name=programme_e-infrastructure

Introduction

- E8. The projects sought under this circular are primarily intended to contribute to outcomes 1, 2, 5 and 6 listed above (paragraph E6). Proposals are requested in three main areas:
- e-Research Community Engagement and Support;
 - e-Infrastructure Security;
 - Knowledge Organisation and Semantic Services.

Nature and scope of projects sought

- E9. The table in paragraph E1 gives an overview of the nature, number, length and budget of the projects sought. Information on the context, terms of reference and deliverables for each project area are detailed in the paragraphs indicated in that table (paragraphs E278 onwards).

General expectations

- E10. In addition to any specific expectations given with the further details on the projects sought, the general expectations outlined in paragraphs E11 to E12 apply to all projects funded under this circular.
- E11. Projects are expected to allocate 10 person-days per year to engage in programme-level activities. In particular, all projects are expected to:
- Be aware of and where appropriate work closely with other related JISC-funded projects;
 - Attend relevant special interest groups and other appropriate meetings.
- The Programme Manager will provide guidance to funded projects on which meetings and other projects are likely to be relevant.
- E12. Proposals from single institutions rather than consortia are preferred unless they are required in order to bring together appropriate skills and expertise. Technological approach to be employed

Open Standards

- E13. Interoperability and data transfer are key to e-research technologies and projects are expected to address these issues. Open standards should be used wherever possible, and any deviation from these should be justified in the proposal.

e-Framework

- E14. The e-Framework for Education and Research is an international initiative, by JISC and Australia's Department of Education, Science and Training (DEST), to explore the potential benefits of applying a service-oriented approach to the provision of ICT infrastructure for education and research, and where successful to support its broader adoption by institutions and their suppliers (see: e-Framework Overview Briefing³).
- E15. Its main provision is an evolving knowledge base, presented as the e-Framework web site,⁴ containing information and links to further information on services and their effective use. There is thus technical information about open service standards

³ e-Framework and SOA Briefing http://www.jisc.ac.uk/funding_circular04_06

⁴ <http://www.e-framework.org>

covering pre-specification prototypes, specifications and standards under development, those being implemented and those in general use. There is also information about the usage of services, the domains and context of use, the human level, tasks and processes being supported, scenarios and case studies of how humans make use of service-based applications to accomplish these and technical information about the ways in which the services were brought together (see: Domain, Process and Service Models Briefing⁵).

- E16. These two aspects interact and are expected to evolve as it becomes clear which areas benefit most from a service-oriented approach, and which less. Also commonalities across tasks will refine the services that support them and the provision of services will enable more flexible implementations that allow new practices and processes to evolve.
- E17. Projects are expected to work within the e-Framework by making use of its available information and by contributing to its further development, with the emphasis on the latter in the early stages. How this happens will depend on the nature of the project.
- E18. Where projects carry out technical development, this should be done within the service-oriented approach of the e-Framework and, where possible, should expose and consume functionality via Web Services (SOAP or REST). However, other technical approaches are permissible, where appropriate, eg where existing standards are already in use (such as Z39.50), or where Web services do not yet meet performance or functional needs (such as for secure transactions) (see: Web Services & SOA Briefing⁶).
- E19. Other projects that will not be providing services themselves are encouraged to use web service-enabled tools and applications within their own environment. All projects should be able to contribute to the knowledge base that the e-Framework is developing. This can include domain, practice and process models, scenarios and use cases, and good practice guidelines on the internal and cross-institutional implementation of the technology, as well as information about the service definitions they have used or developed.
- E20. At the interface between users and services there is emerging a thinner but more flexible and capable technical user environment layer. This is taking two forms: the continued development of portal technology and the so-called rich client platform. Both of these provide a capable plug-in software framework that can take much of the work out of developing the user interface, allowing concentration on the coordinating functionality of the tool or application (see: Service Oriented Application Integration Layer Briefing⁷).
- E21. The goal is to both to record relevant project outputs and outcomes, in order to support those seeking to implement a service-oriented approach. By sharing developments and experiences internationally, we hope to be able to do this more effectively and rapidly than if done alone, and by developing and adopting open standards, establish a wider and more open market enabling costs to be reduced.
- E22. Where appropriate, all projects will contribute the following to JISC and the e-Framework:
- Domain maps that reflect consensus-based practices, processes and supporting systems. These will take the form of a functional specification and technical architecture model showing the services and components in place within the full workflow
 - Service usage models (SUMs). These provide a description of the needs, requirements, workflows, management policies and processes within a domain

⁵ e-Framework DP and SM Briefing http://www.jisc.ac.uk/funding_circular04_06

⁶ e-Framework Web Services and SOA Briefing http://www.jisc.ac.uk/funding_circular04_06

⁷ e-Framework Service Oriented Application Integration Layer Briefing http://www.jisc.ac.uk/funding_circular04_06

and the mapping of these to a design of a structured collection of service genres and service expressions, resources, associated standards, specifications, data formats, protocols, bindings etc, that can be used to implement software applications within the domain

- Services – where not already recorded in the e-Framework, additional services identified in the course of the projects, and any emergent interoperability specifications, should be contributed

Open Source Software

- E23. It is expected that software outputs will use open standards and will normally be open-source unless a case is made to the contrary and accepted by the Panel. Applicants should make clear the licence under which software outputs will be released, mechanisms that will be put in place for community contribution (users and developers) throughout the project, and the sustainability plan for the project beyond the period of project funding. Applicants are encouraged to consult with JISC's open source software advisory service OSS Watch (www.oss-watch.ac.uk/) and the Open Middleware Infrastructure Institute UK (OMII-UK: www.omii.ac.uk), on matters relating to open source software development, Grid standards, best practice in software engineering, and use of the OMII-UK software and repository. Applicants should refer to JISC's Policy on Open Source Software for JISC Projects and Services; see www.jisc.ac.uk/about_opensourcepolicy.html

Structure of Proposals

- E24. The structure of proposals is set out in the main text of the circular. Additional information needed will be outlined under the detailed project descriptions in the sections that follow (paragraph E28 onwards).

Submission of Proposals

- E25. Information on the bidding process and submission of proposals is set out in the main text of the circular. Bids in response to this call for projects should be sent to efrastructure-bids@jisc.ac.uk, with the name of the lead institution in the subject line. If more than one bid is submitted by an institution, these must be submitted in separate messages.

Further Information

- E26. All general enquiries regarding this appendix should be sent to Matthew Dovey (tel: 07876 445 403; email: m.dovey@jisc.ac.uk). Additional contacts are provided for specific project areas in the relevant sections below.
- E27. Any enquiries regarding the proposal submission process should be sent to Avalon McAllister (tel: 0117 931 7124; email: a.mcallister@jisc.ac.uk).

Information on specific project areas: e-Research Community Engagement and Support

Context

- E28. This area of the call focuses on three strands of activity within Community Engagement and Support of the e-Infrastructure Programme, namely:
- I.Barriers to Take-Up of e-Infrastructure Services;
 - II.Support for Research: Tools & Standards;
 - III.Use Cases and Service Usage Models for e-Infrastructure.
- E29. Community engagement and support is essential to ensure that the tools and services developed in the e-Infrastructure Programme are meeting the needs of the research community and complementing national developments and exemplar working practices. Equally important is the consideration of the ways in which the wider research community can be supported in the uptake and use of e-infrastructure tools, technologies and services.
- E30. Work within the call area of Community Engagement and Support will underpin all of the work-package activities in the JISC e-Infrastructure Programme by enhancing core services and community best practice and by drawing from community successes and investment, such as the e-Science Core Programme. It will particularly address research community requirements and ways in which this community can be enabled to exploit e-infrastructure services, tools and resources to support new capabilities and research practices.
- E31. Similarly, it is intended that the proposed work extends the e-research community into new disciplines, groups and activities by engagement with both existing 'e-science' communities and new adopters. It is also envisaged that this will help to make connections across and within communities.
- E32. The overall outcomes as a result of the project outputs completed under this call area are expected to be:
- Broader, more effective and quantifiable use of the UK e-infrastructure;
 - Support for new capabilities and research practices underpinned by UK e-infrastructure services and/or service functions.

Call I - Barriers to Take-Up of e-Infrastructure Services

Summary

- E33. JISC invites proposals for a project to undertake work to identify barriers to take-up of e-infrastructure services, and to address these through research, user engagement, training and awareness-raising, and assessment.
- One project sought
 - Project should last two years
 - A budget of around £350,000 is available
- E34. All projects should start in March 2007 and finish by the end of March 2009.
- E35. JISC reserves the right not to commission the full amount of funding under this call area, and to issue a subsequent call to address any remaining gaps.

Terms of Reference

- E36. The primary beneficiary of the project activities in this call area is the UK Research Community, which is considered to comprise the research disciplines complementing those represented by the UK Research Councils,⁸ namely:
- Arts & Humanities
 - Biotechnology and Biological Sciences
 - Engineering and Physical Sciences
 - Medical Sciences
 - Natural Environment
 - Particle Physics and Astronomy
 - Social Sciences
- E37. All successful projects are expected to show evidence of building upon existing work from the e-Science Core Programme, within JISC and from UK and international developments. Projects are also expected to cover at least four of the research disciplines listed under paragraph E36 during the course of their funded activity, with the inclusion of either the Arts & Humanities or Social Sciences as one area of focus.
- E38. Suggested outcomes for the 'Barriers to Take-Up' strand should be:
- A better understanding of how e-infrastructure services can enhance their resource and service delivery and support of the research community
 - A better understanding of what services and/or service functions are required in order to underpin the effective delivery of UK e-infrastructure
 - A better understanding of the commonalities and differences in disciplinary approaches to present take-up of e-infrastructure tools and technologies
 - A better understanding of required production-level capabilities for UK e-infrastructure
 - A better awareness in JISC of where to place future funding and programme development for training within the research community
 - A better trained research community, with more members able to use e-Science tools within their disciplines
 - Raised awareness and dissemination across both the research community and the existing services about training opportunities available for researchers in e-Science/Research

⁸www.rcuk.ac.uk

Approach

- E39. This activity is a phased approach to identify barriers and to address these through research, user engagement, training and awareness-raising, and assessment (see Fig. 1). The identification of barriers will comprise examining barriers to take-up of a selection of existing JISC-funded 'e-infrastructure services'. This will be underpinned by a user requirements exercise focusing on 'early adopters' of these services and the resources (eg 'e-science' tools, datasets, documentation) that these services may provide. The result of the requirements-gathering activity is to determine what users require from these services, and recommendations for user adoption and effective use of such services.
- E40. Through this process, barriers will be identified and a baseline will be established in order to address issues of take-up. Barriers that can be resolved through training users, for example, on how to use existing services and technologies, will be undertaken as part of a key sub-activity (see Training and Awareness paragraphs E43 to E49), which will be further supported by awareness-raising. The effectiveness of the process will be assessed and fed into the project activity and to service delivery where applicable. The process is intended to be iterative, and a diagram illustrating the full cycle of activity is provided in Fig. 1.

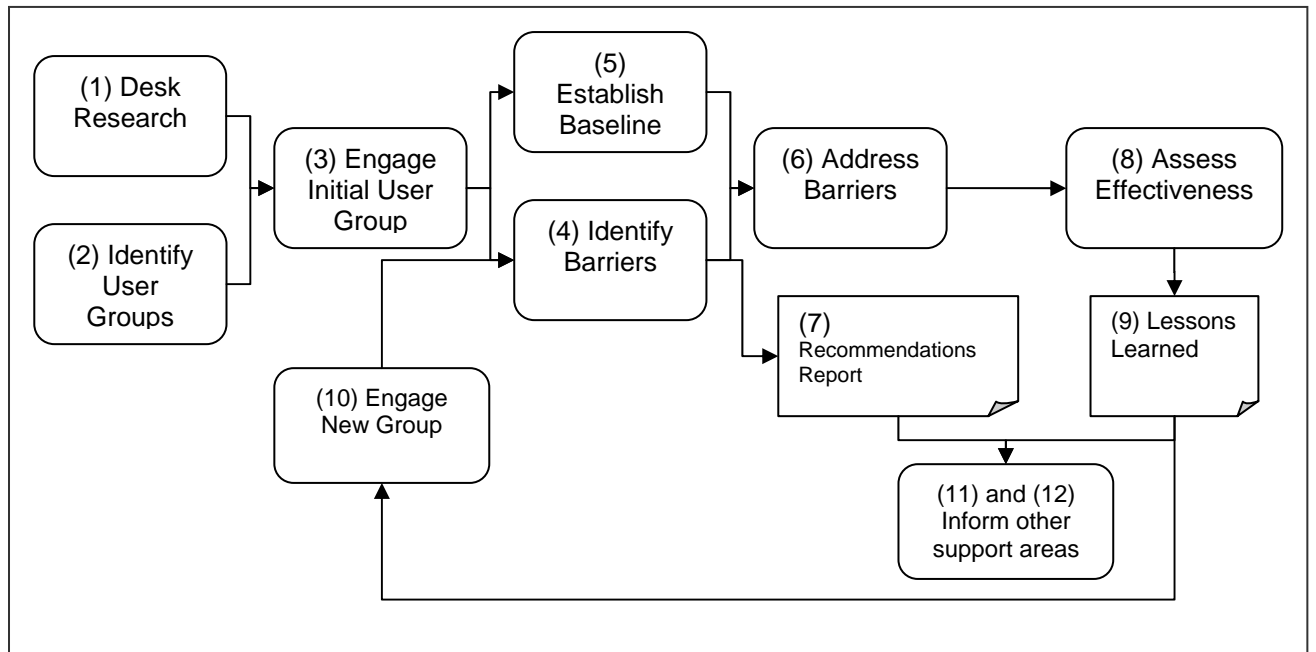


Fig.1: Barriers Project Life Cycle

- E41. The project should undertake the following steps, which are mapped to Fig. 1:
- (1) Conduct systematic desk research on work being undertaken and/or existing in the area, such as disciplinary approaches and differences to take-up of e-infrastructure services and resources.
 - (2) Identify receptive 'early adopter' groups within the research community who could potentially use e-infrastructure services and resources within their disciplines but are currently doing so to a limited degree.
 - (3) Informed by step (2), to undertake a user requirements exercise on current use of JISC-funded e-infrastructure services and resources and to identify potential future uses. The selected JISC-funded services represent those which form part of the current UK e-infrastructure and these should be addressed in this exercise, namely:

- Access Grid Support Centre – www.agsc.ja.net
 - Data Centres – EDINA (<http://edina.ac.uk>), MIMAS (www.mimas.ac.uk), UKData Archive (www.data-archive.ac.uk/), AHDS (www.ahds.ac.uk)
 - Digital Curation Centre (DCC) – www.dcc.ac.uk
 - National Centre for Text Mining (NaCTEM) – www.nactem.ac.uk
 - National Grid Service (NGS) – www.ngs.ac.uk
 - UKERNA – www.ja.net/about/ukerna/ukerna.html
 - Viznet – <https://wiki.viznet.ac.uk/bin/view>
- (4) Informed by step (3), to identify barriers to take-up of e-infrastructure services by the research community; these may encompass, for example, access management, collaborative working, data sharing, disciplinary differences, licensing and IPR.
 - (5) Establish baseline information for later impact assessment. This should include measurable evidence, for example, number of users of a given service or resource, and perceived ease of use of a given service or resource.
 - (6) Address barriers that can be resolved through training users on how to use existing e-infrastructure services and resources; see Training & Awareness section below.
 - (7) Make recommendations based on the outputs of step (4).
 - (8) Assess the effectiveness of the actions in step (6), using the previously established baseline.
 - (9) Lessons learned report, created from the assessment of effectiveness in step (8).
 - (10) Feed the lessons from assessing effectiveness into the next iteration of engagement with users (which may be informed by the initial groups) and identification of any further barriers.
 - (11) Inform and support other work in this call area, namely:
 - Tools & Standards
 - Use Cases & Service Usage Models
 - (12) Help inform and prioritise software development commissioned from the OMII-UK (www.omii.ac.uk).

- E42. The deliverables of this project activity should be (see specific deliverables for Training & Awareness activity below):
- A report containing findings on barriers to take-up of e-infrastructure services, including any disciplinary differences that were identified. This should be based on:
 - Existing and current work on barriers informed by desk research
 - Primary research with actual users and potential users in the research community
 - A baseline report on the current state of user adoption in relation to e-infrastructure services
 - A set of recommendations on what needs to be resolved outside of this strand in order for e-infrastructure services to be better used
 - A set of recommendations on how training can assist in overcoming barriers to adoption of e-infrastructure services (see also Training & Awareness section below)

- Workshops to identify user needs and provide training (see also Training & Awareness section below)
- Lessons learned report

Training & Awareness

- E43. The training activity should focus on two areas of user engagement. Firstly it should address barriers that can be resolved through formative⁹ training of receptive early adopters on how to effectively use existing e-infrastructure services and resources. The results of the training activity will then be fed back into step (4) and another iteration of the process can follow with other identified user groups. Secondly, the training activity should consolidate and coordinate existing training and awareness expertise across the research community based on the identified barriers, as well as providing a focal point for relevant resources and dissemination information.
- E44. This activity builds on existing work, such as the Training & Awareness programme (www.jisc.org.uk/programme_eresearch) funded by the JISC Support for Research Committee, comprising:
- ARIA – http://www.jisc.ac.uk/project_aria.html
 - ReDRESS – <http://redress.lancs.ac.uk/>
- E45. The work further complements the new Repositories Support Project under the JISC Digital Repositories programme, which will have responsibility for supporting institutions in setting up and developing repositories for learning, teaching and research. The project is led by the Sherpa team (www.sherpa.ac.uk/) at the University of Nottingham. The successful bidder will be expected to liaise closely with these project teams.
- E46. Other JISC-funded services and pilot services that support training in areas relevant to e-infrastructure and that could form part of the investigations include:
- Access Grid Support Centre – www.agsc.ja.net
 - AHDS – www.ahds.ac.uk
 - Digital Curation Centre – www.dcc.ac.uk
 - EDINA – <http://edina.ac.uk>
 - eScience Support Centre for the Arts & Humanities – www.ahessc.ac.uk
 - MATU – Middleware Assisted Take-Up Service – www.matu.ac.uk/training/
 - MIMAS – www.mimas.ac.uk
 - National Centre for Text Mining – www.nactem.ac.uk
 - NGS – www.ngs.ac.uk
 - OSS-WATCH – www.oss-watch.ac.uk/
 - TASI – Technical Advisory Service for Images – www.tasi.ac.uk/training/training.html
 - UKERNA – www.ja.net/services/training/
 - UKOLN – www.ukoln.ac.uk/events/
 - Netskills – www.netskills.ac.uk/
- E47. Other training initiatives supporting the research community include:
- AHRC – ICT Methods Network – www.methodsnetwork.ac.uk/activities/workshops.html
 - NeSC – www.nesc.ac.uk/
 - NCESS – www.ncess.ac.uk/events/
 - OMII-UK – www.omii.ac.uk
- E48. The training activity will encompass the following:

⁹ The intention of this training is to both train the identified early adopters and evaluate its effectiveness to inform future training.

- Train receptive early adopter groups using a selection of the services and resources and to inform service delivery
- Assess the effectiveness of the training (eg in terms of delivery and impact on confidence of use of the e-infrastructure)
- Feed-back lessons learned from the assessment into another user group within identification of barriers
- Coordinate work with training organisations and relevant existing activity (see below) in the collation of information on training availability and in dissemination of training events
- Investigate models for training funding and sustainability and to provide a set of recommendations;
- Develop baseline training material, in conjunction with relevant training organisations, which addresses new areas of training and identified barriers

E49. The deliverables of the training activity should be:

- A consolidation of disparate information on training and support relevant to both the research community and existing training organisations in the use of e-infrastructure services, tools and resources. This will include a coordinated and centralised baseline set of resources for the benefit of users and trainers of e-infrastructure technologies and tools, made available online and publicly accessible, including but not limited to:
 - Training contact information
 - Training events and dissemination information
 - FAQs or other relevant resources related to e-infrastructure technologies, standards and tools (this also supports Strands 2 and 3)
- An investigative report with recommendations on models for funding and sustainability of training activity
- An analysis report on user needs and identified gaps in training based on the assessment, which can inform services and funders of training for more effective take-up and use of e-infrastructure
- Baseline training material that addresses new areas of training and identified barriers
- Training workshops for identified early adopters in the research community and through existing training services that will help embed outcomes of project activity

Other Considerations /Expectations

E50. The work under 'Barriers to Take-Up' builds upon and complements existing activities both in the UK (eg ESRC-funded study 'Adoption of e-Research Technologies')¹⁰ and internationally, and as identified in a selection of published resources.¹¹ Successful

¹⁰

¹¹ (1) ACLS (2005). *Draft report of the American Council of Learned Societies' Commission on Cyberinfrastructure for Humanities and Social Sciences*. www.acls.org/cyberinfrastructure/cyber_report.htm

(2) AHDS (2006). *e-Science Scoping Study*. www.ahds.ac.uk/e-science/e-science-scoping-study.htm

(3) Australian Government (2005). *An e-Research Strategic Framework: Interim Report of the e-Research Coordinating Committee*.

www.dest.gov.au/sectors/research_sector/policies_issues_reviews/key_issues/e_research_consult/interim_report.htm

(4) British Academy (2005). *e-Resources for Research in the Humanities and Social Sciences – A British Academy Policy Review*. www.britac.ac.uk/reports/eresources/

(5) Fox, G. and Walker, D. (2003) *The UK e-Science Programme Gap Analysis* (www.nesc.ac.uk/technical_papers/UKeS-2003-01/).

(6) Internet2 (2006). *Final Report: Workshop on Effective Approaches to Campus Research Computing Cyberinfrastructure*. middleware.internet2.edu/crcc/docs/internet2-crcc-report-200607.html

bidders undertaking this activity are expected to show some form of explicit liaison activity with UK and international organisations undertaking related work.

- E51. All bidders are expected to consult closely and collaborate with the services as listed in step (3) under 'Approach' (see paragraph E41). Projects are further requested to describe their methodologies for identifying barriers and user requirements in the undertaking of the work, and the phasing of each of the deliverables as outlined under 'Approach' (see paragraphs E41 and E42) and 'Training and Awareness' (see paragraph E49).

Further information for this strand

- E52. All enquiries regarding this section of the call should be sent to Ann Borda, Programme Manager, JISC Executive (tel: +44 (0)20 7848 1741; email: a.borda@jisc.ac.uk).

(7) NSF (2003). *Revolutionizing Science and Engineering through Cyberinfrastructure: Report of the National Science Foundation*. www.communitytechnology.org/nsf_ci_report

(8) NSF Cyberinfrastructure Council (2006). *NSF's Cyberinfrastructure Vision for the 21st Century* (July 2006 – v.7.1). middleware.internet2.edu/crcc/docs/internet2-crcc-report-200607.html

(9) Schopf, J. and Newhouse, S. (2004) *Report on State of Grid Users*. www.omii.ac.uk/dissemination/paper_state_of_grid_users.pdf

(10) TERENA (2007). *Foresight Study into Research and Education Networking*. www.terena.nl/activities/earnest

Call II – Support for Research: Tools & Standards

Summary

- E53. JISC invites proposals for a project to undertake work in the provision of advice about and consolidation of existing and burgeoning technical standards and e-infrastructure tools in use and/or being developed by the research community.
- One project sought
 - Project should last two years
 - A budget of around £300,000 is available
- E54. All projects should start in March 2007 and finish by the end of March 2009
- E55. JISC reserves the right not to commission the full amount of funding under this call area, and to issue a subsequent call to address any remaining gaps.

Scope

- E56. This strand of activity aims to extend ICT support of the research community in the provision of advice about and consolidation of existing and burgeoning technical standards and e-infrastructure tools (including middleware, standard APIs, and web service protocols) that are in development and used by the research community. This would largely encompass 'open and adopted' standards and tools underpinning e-infrastructure systems and would be ideally relevant across several domains. Resources made available as part of the activity will promote awareness of the range of standards and tools. This will include the provision of unbiased recommendations for both open and adopted, as well as proprietary tools, for instance, where they are known to have become adopted in the community.

Terms of Reference

- E57. The primary beneficiary of the project activities in this call area is the UK Research Community, which is considered to comprise the research disciplines complementing those represented by the UK Research Councils,¹² namely:
- Arts & Humanities
 - Biotechnology and Biological Sciences
 - Engineering and Physical Sciences
 - Medical Sciences
 - Natural Environment
 - Particle Physics and Astronomy
 - Social Sciences
- E58. All successful projects are expected to show evidence of building upon existing work from the e-Science Core Programme, within JISC and from UK and international developments. Projects are also expected to cover at least four of the research disciplines listed under paragraph E57 during the course of their funded activity, with the inclusion of either the Arts & Humanities or Social Sciences as recommended areas of focus.
- E59. Suggested outcomes for the 'Tools & Standards' strand should be:
- Improved best practice and quality assurance in use and development of open and adopted standards and tools

¹²www.rcuk.ac.uk

- More advanced development of e-Framework initiative, with wider range of examples and wider take-up by researchers and contributors
- Better informed commissioning of work of JISC-funded ICT initiatives

Approach

E60. The project will encompass the following:

- (1) Scope new, current and past activity in the research community, which has generated and/or used specific tools and standards in support of research. Such areas of investigation should include, but not be limited to:
 - Access Grid
 - Access management
 - Collaborative working
 - Data sharing, storage and management
 - Discovery tools
 - Grid computing
 - Semantic interoperability
 - Visualisation
 - Workflows
- (2) Collate and create a list of pointers (as informed by step 1) to existing tools and standards as made available and/or described in web resources and community and project sites.
- (3) Create an open source 'tool-finder' to enhance the usability and usefulness of (2).
- (4) Advise on and create consensus-building in the area of 'open and adopted' standards and tools across existing and planned work in the VRE and e-Infrastructure programmes, as well as the JISC e-Framework initiative, and work in other relevant programme areas, such as Digital Repositories.
- (5) Disseminate information about the outputs of the activity and to engage with services (ie those listed under 'Barriers to Take-Up') in order to embed outputs where applicable.
- (6) Inform and support the work under 'Barriers to Take-Up'.
- (7) Inform and support the work of the JISC-funded Open Source Standards advisory service (OSS-WATCH – www.oss-watch.ac.uk), and the work of e-infrastructure services as identified in 'Barriers to Take-Up'.
- (8) Liaise with UKOLN over the Standards Catalogue currently in development (<http://standards-catalogue.ukoln.ac.uk/>), in order to ensure that the Catalogue incorporates standards in use in e-infrastructure for research.
- (9) Help inform and prioritise software development commissioned from OMII-UK – www.omii.ac.uk.

Deliverables

E61. The deliverables of this project activity should be:

- An advisory model for the research community on open and adopted standards and in support of research
- An authoritative focal point that coordinates disparate information on open tools and standards generated for and in use by the research community
- Dissemination and engagement with relevant services
- An authoritative source for funders and developers of open and adopted tools and standards

- A scoping report, which identifies areas for inclusion in the collation of open and adopted standards and tools
- A coordinated and centralised baseline set of resources and unbiased recommendations about open and adopted standards and tools of use in and of relevance to the research community, to be made available online and publicly accessible
- A searchable and taxonomically arranged database of e-research tools (descriptors) and related information
- A searchable and taxonomically arranged database of standards (descriptors) and related information
- A set of resources and recommendations, tools and standard descriptions for submission to the JISC e-Framework initiative in a form appropriate for the purpose

Other Considerations /Expectations

- E62. This activity will require an understanding of the remit and work of existing project areas in which tools are being developed under JISC programmes, such as e-Learning, Users and Innovation, and Virtual Research Environments (VREs), and the work of UK research community bodies like OMII-UK, and internationally, such as EGEE (www.eu-egee.org/) and Internet2 (www.internet2.edu). Likewise, an understanding is required of those organisations who are involved in the development and/or implementation of standards, eg UKOLN (www.ukoln.ac.uk), CETIS (www.cetis.ac.uk), and internationally, eg W3C (www.w3.org/) and Globus (www.globus.org/).
- E63. The work also builds upon a range of other core activities, such as TechWatch¹³ reports, and the UKOLN Standards Catalogue (<http://standards-catalogue.ukoln.ac.uk/>), the JISC-funded VRE project on Standards Interoperability (eReSS – www.hull.ac.uk/esig/eress/), the ReDRESS project supporting training & awareness in ICT for e-Social Scientists (<http://redress.lancs.ac.uk/>), the e-Science Scoping Study by the AHDS (www.ahds.ac.uk/e-science/e-science-scoping-study.htm) and advisory services such as OSS-WATCH, as well as leading international developments.¹⁴
- E64. Successful bidders undertaking the activity are expected to liaise closely with existing JISC projects (eg the eReSS project), and to show some form of explicit liaison activity with UK (eg UKOLN) and international organisations undertaking related work throughout the duration of funding.
- E65. Additionally, the work is intended to inform and contribute to the JISC e-Framework for Education and Research (see E14 – E22). For example, some relevant e-infrastructure technologies have already been contributed to the JISC e-Framework. These contributions should function as input to the project, but will require further elaboration. For that reason, any relevant (web service) standard or tool that the project evaluates is expected to be delivered as service genres, definitions or implementations to the e-Framework. Since the e-Framework initiative is only intended to capture the bare, cross-domain essentials of these interoperability technologies, the project is also expected to provide representations that are relevant to the research domain alone (see also ‘Use Cases and Service Usage Models’ strand below).

¹³ www.jisc.ac.uk/techwatch

¹⁴ Such as ETICS (<http://etics.web.cern.ch/etics/>); NSF Middleware Initiative (www.nsf-middleware.org), OMII-Europe (www.omii-europe.com/), CANARIE (www.canarie.ca); CROWN (www.crown.org.cn/en/) and NAREGI (www.naregi.org/index_e.html).

Further information for this section

- E66. All enquiries regarding this section of the call should be sent to Ann Borda, Programme Manager, JISC Executive (tel: +44 (0)20 7848 1741; email: a.borda@jisc.ac.uk).

Call III – Use Cases and Service Usage Models

Summary

- E67. JISC invites proposals for a project to collect use cases on working methods and practices in the use or engagement of e-infrastructure tools and technologies by the research community. This activity will also involve undertaking evaluative and comparative work in order to provide a more accurate overview of the current and new landscape of working methodologies and to draw from this a set of Service Usage Models (SUMs) to contribute to the JISC e-Framework initiative.
- One project sought
 - Project should last two years
 - A budget of around £300,000 is available
- E68. All projects should start in March 2007 and finish by the end of March 2009
- E69. JISC reserves the right not to commission the full amount of funding under this call area, and to issue a subsequent call to address any remaining gaps.

Scope

- E70. The aim of this strand is to understand better how the research community of users actually engage with e-infrastructure, and particularly focus on working methods and practices in the use or engagement of e-infrastructure tools and technologies to solve or address specific research problems or processes. One of the ways of achieving this is to collect use cases and to engage in some form of evaluative and comparative work. For example, disciplinary comparisons of certain e-infrastructure component use, and evaluation of new use cases showing how these advance usability relative to that which may be undertaken by existing standards development organisations, service delivery providers and vendors.
- E71. The intended outcome is a more accurate overview of the current and new landscape of working methodologies and use in order to understand potential future directions and to progress toward a consensus on best practice and cross-working opportunities.

Terms of Reference

- E72. The primary beneficiary of the project activities in this call area is the UK Research Community, which is considered to comprise the research disciplines complementing those represented by the UK Research Councils,¹⁵ namely:
- Arts & Humanities
 - Biotechnology and Biological Sciences
 - Engineering and Physical Sciences
 - Medical Sciences
 - Natural Environment
 - Particle Physics and Astronomy
 - Social Sciences
- E73. All successful projects are expected to show evidence of building upon existing work from the e-Science Core Programme, within JISC and from UK and international developments. Projects are also expected to cover at least four of the research

¹⁵ www.rcuk.ac.uk

disciplines listed under paragraph E72 during the course of their funded activity, with the inclusion of either the Arts & Humanities or Social Sciences as one area of focus.

- E74. Suggested outcomes for the 'Use Cases and Service Usage Models' strand should be:
- A more accurate overview of the current landscape of working methods, user behaviour, and use of e-infrastructure in order to understand potential future directions and to achieve a consensus on best practice and cross-working opportunities
 - A better understanding of the commonalities and differences in disciplinary working methods and user behaviour in the use of e-infrastructure tools and technologies
 - Support for the work of the JISC e-Framework, particularly in the provision of domain and Service Usage Models of relevance and applicability to the research community.

Approach

- E75. The project should undertake the following:
- (1) Conduct systematic desk research on work being undertaken and/or existing in the area, such as disciplinary approaches to use cases in key research community projects (also see Strand 2), and relevant initiatives by standards development organisations, service delivery providers and vendors.
 - (2) Informed by (1), to find and collect 15 or more use cases that will provide a more accurate overview of the current and new landscape of working methods, user behaviour and use of e-infrastructure tools, facilities and components. Use cases are expected to include at least one or two examples drawn from the Barriers to Take-Up strand and from other e-Infrastructure call areas, as well as a cross-section of examples from relevant JISC programmes, such as Virtual Research Environments, and Repositories and Preservation.
 - (3) Compare and evaluate use cases in order to identify commonalities and differences (eg disciplinary) in working methods and practices.
 - (4) Make progress toward a consensus on best practice and cross-working opportunities.
 - (5) Draw from the use cases, a series of domain and Service Usage Models that can be incorporated into the JISC e-Framework.
 - (6) Create some form of consensus-building across existing and planned work in the e-Infrastructure Virtual Research Environments (VRE) Programmes, and work in other relevant programme areas, such as Digital Repositories.
 - (7) Inform and support other work under this call, namely 'Barriers to Take-Up', and 'Tools & Standards'.
 - (8) Help inform and prioritise software development commissioned from OMII-UK.

Deliverables

- E76. The deliverables of this project activity should be:
- A set of 15 or more use case scenarios describing actual working methods and practices in the use or engagement of e-infrastructure tools and technologies to solve or address specific research problems or processes;

- A set of domain and service usage models drawn from the use cases;
- A report that provides a comparative overview (eg disciplinary differences), and identification of common solutions, issues and gaps drawn from the use.

Other Considerations /Expectations

- E77. This activity builds on a range of existing work, such as the e-learning reference model projects (<http://www.elframework.org/refmodels/ladie/www.elframework.org/refmodels/>) and the Information Environment Service Registry (<http://iesr.ac.uk/>), as well as project outputs from JISC programmes such as Virtual Research Environments, Users and Innovation, Digital Repositories and e-Learning. It also seeks to build on disciplinary-based investigations and development of use cases, such as that undertaken by the AHRC ICT Methods Network (www.methodsnetwork.ac.uk/).
- E78. Successful bidders are expected to liaise closely with existing projects, and especially to collaborate with the development of the JISC e-Framework initiative, particularly in the establishment of Service Usage Models (SUMs) and service expressions drawn from the use cases (see E14 – E22).

Further information

- E79. All enquiries regarding this section of the call should be sent to Ann Borda, Programme Manager, JISC Executive (tel: +44 (0)20 7848 1741; email: a.borda@jisc.ac.uk).

Information on specific project areas: e-Infrastructure Security

Context

- E80. The importance of security and access management in facilitating the formation of virtual organisations (VOs), ensuring appropriate access to data and resources and accounting for their usage is starting to be recognised by a broader academic community internationally. The recent Internet2/NSF report on issues facing campuses regarding cyber infrastructure is a good example of the concerns to be addressed globally¹⁶ and the MAMS project¹⁷ is a good example of national co-ordination of access management for researchers that recognises the impact in other areas.
- E81. This has been in parallel with developments in the commercial sphere to facilitate similar goals, such as the Liberty Alliance's ID-WSF¹⁸ and WS-Federation.¹⁹ These have worked to open standards and so have seen other groups develop that are relevant to the academic community, such as a movement that has been recently initiated by Internet2 in order to provide an open-source implementation of the Liberty WS profiles, as a natural continuation of the OpenSAML development effort.²⁰
- E82. Security and access management have also been a core part of the JISC strategy since its inception. Through development programmes and funding for services such as Athens,²¹ JISC has ensured that appropriate facilities have been in place to both meet the current service requirements of its community and to focus on emerging requirements in this arena.
- E83. A full history of JISC funding for access management and security can be found at www.jisc.ac.uk/middleware_team.html.
- E84. The recent Core Middleware: Infrastructure programme²² and Core Middleware: Technology Development programme²³ have built the foundation blocks for the development of a new access management service within the UK. The UK Access Management Federation will be formally launched in January 2007.²⁴ This service aims to support the four strategic requirements for access management within the UK that were identified as part of the JISC AAA Programme:²⁵
- Access Management for internal (intra-institutional) applications;
 - Management of access to third-party digital library-type resources;
 - Access Management for inter-institutional use – stable, long-term resource sharing between defined groups (eg shared e-learning scenarios);
 - Inter-institutional use – ad hoc collaborations, potentially dynamic in nature (eg Virtual Organisations).
- E85. Meeting the fourth requirement will be an essential part of achieving the vision of an e-Infrastructure as described in the Science and Innovation Investment Framework 2004–2014.²⁶ Whilst the implementation of federated access management is a positive step towards provisioning an e-Infrastructure that can meet the evolving

¹⁶ middleware.internet2.edu/crcc/docs/internet2-crcc-report-200607.html

¹⁷ www.melcoe.mq.edu.au/projects/MAMS/

¹⁸ See www.projectliberty.org/ for more information.

¹⁹ www-128.ibm.com/developerworks/library/specification/ws-fed/

²⁰ Currently only a discussion list is available – see <https://mail.internet2.edu/wws/info/liberty-opensource>

²¹ www.athensams.net

²² See www.jisc.ac.uk/programme_cminfrastructure.html for further information.

²³ See www.jisc.ac.uk/programme_middleware.html for further information.

²⁴ Information on the UK Access Management Federation is available at www.ukfederation.org.uk/

²⁵ See www.jisc.ac.uk/programme_aaa.html for further information.

²⁶ www.hm-treasury.gov.uk/media/95846/spend04_sciencedoc_1_090704.pdf

requirements of researchers, further work is required to allow institutions the opportunity to engage with new opportunities.

- E86. As such, JISC is planning an ongoing development programme for e-Infrastructure Security. The first call on Identity Management and Levels of Assurance has been released in April and this circular forms the second call seeking projects to investigate Federated Tools and Services and Virtual Organisation Management Tools and Services.

Other considerations and expectations

- E87. Projects should indicate the relation of their work to existing and emerging tools and national and international standards in this area. Projects that leverage existing JISC investments, either directly or through improved interoperability with authentication and authorisation management tools and systems, are particularly welcomed, eg projects helping to bridge the traditional boundaries such as library/e-Science, institutional/international, and administrator/developer.

- E88. All projects will be expected to support JISC dissemination activities, to ensure that their outputs are made available to the community. For example, there is currently a repository of outputs from the Core Middleware programmes being established and projects will be expected to contribute appropriate materials such as reports to this. Given a major component of sustainable projects is engagement with the community, then it is expected that bids will reflect their plans for dissemination from the start of the project.

- E89. Where software or services are expected to be 'service ready' they should be at a prototype level of robustness, meaning that users should be able to experiment with them 'outside the lab' with smaller datasets:

- Code – code should be appropriately structured with inline commenting to explain what each module or function does. It should be written with re-use and maintainability in mind (so should be demonstrably version controlled) and show evidence of being scalable. Any database should have appropriate design documentation and, as with the code, be designed to work within a production environment
- Documentation – bidders should document the functionality of the software or service at a user requirements and functional level with some form of issue management in place. Documentation should be sufficient that test cases can be written
- Installation – it is expected that there should be basic guidance to installation but that the software or service may be installed by a reasonably competent technical user
- Standards compliance – where appropriate, the software or service should be developed in line with existing open and adopted standards. It may not yet be fully compliant but should have a path mapped to compliance
- Testing – should be to a test plan and preferably carried out by a team or individual separate from the development team. It should be sufficient to ensure that the software or service could reliably run in more than one environment (eg on different browsers or server platforms) and handle exceptions or errors appropriately. This may be combined with peer review to assure code and software/service quality
- Usability – the software or service should be usable but may have a basic interface and help functions

Call IV - Federated Tools and Services

Summary

- E90. JISC invites proposals for projects in the following areas:
- Integration of Grid and Shibboleth²⁷ and vice versa;
 - Developing and applying n-tier web service architectures;
 - Applying existing virtual home for identity solutions.
- E91. It is envisaged that funding of £975,000 be available over two years from the date of award. This will comprise a mix of bigger projects that aim to embed and establish in areas where existing work has been done and small projects that demonstrate and produce papers and reports with a view to identifying later larger projects. Wherever possible, the aim will be to produce 'service-ready' outputs²⁸ from projects. JISC reserves the right not to commission the full amount of funding under this call, and to issue a subsequent call to address any remaining gaps.
- E92. All projects should start in March 2007 and finish by the end of March 2009.

Terms of reference

- E93. It is envisaged that the Federated Tools and Services area will consist of approximately five projects in the region of £190,000 each to give a total for this area of around £975,000. This area of work splits into three sub-areas of interest:
- Integration of Grid and Shibboleth²⁹ and vice versa. Projects such as SHEBANGS,³⁰ ESP-GRID,³¹ Grid-Shib³² and Shib-Grid³³ have shown what can be achieved, but further work is needed to widen the scope of what is known. It is therefore expected that projects will take account of existing work and produce demonstrators. All work should be in conjunction with the National Grid Service (NGS)³⁴
 - Developing and applying n-tier web service architectures. As portals are developed further it will become increasingly important to resolve n-tier web services. There is already existing work on this area, such as the SPIE³⁵ project, that should be used to inform work. Bids within this sub-area will be expected to establish consensus nationally and cover one or more of the following:
 - OpenSAML 2.0 integration with Shibboleth. Any project would be expected to work closely with the Shibboleth development community, including Internet2
 - Solutions to extend Shibboleth to allow n-tier, again working closely with the Shibboleth development community and Internet2
 - Application of non-Shibboleth n-tier via SAML 2.0
 - Applying existing virtual home for identity solutions. There are now several solutions to virtual home for identities, such as ProtectNetwork,³⁶ TypeKey³⁷

²⁷ Throughout this document, the word 'Shibboleth' is used to refer to the access management architecture; where it is used in any other sense then it will be suitably qualified.

²⁸ See 'Other Considerations' for a full description of the definition of 'service ready'.

²⁹ Throughout this document, the word 'Shibboleth' is used to refer to the access management architecture; where it is used in any other sense then it will be suitably qualified.

³⁰ www.mc.manchester.ac.uk/research/projects/shebangs

³¹ wiki.oucs.ox.ac.uk/esp-grid/

³² gridshib.globus.org/

³³ www.oesc.ox.ac.uk/activities/projects/index.xml?ID=ShibGrid

³⁴ www.ngs.ac.uk

³⁵ <http://spie.oucs.ox.ac.uk/>

³⁶ www.protectnetwork.org/index.html

³⁷ <http://sdss.ac.uk/wiki/wiki.pl?TypeKeyIdIdentityBridge>

and OpenIdP,³⁸ meaning that the remaining work to be done to implement them is within development of use cases for their application, tie in with levels of assurance on authorisation and selection of a service that could be used in conjunction with the UK Access Management Federation. Bids should therefore cover one or more of the following:

- Research and demonstrator project(s) to establish what existing solutions are in place and the use cases and scenarios that they could be used within, including how these would tie in with the Levels of Assurance work that has been awarded as part of the April call. It is expected the outputs of this area should include best practice use of virtual homes for identities
- Community liaison and service establishment project to work with JISC services (eg UKERNA) and the community to establish a virtual home for identities service (note that JISC may well not be the one to provide this service)

Further information

- E94. All general enquiries regarding this circular should be sent to James Farnhill, Programme Manager, JISC Executive (tel: +44 (0)7766 44 22 59; email: j.farnhill@jisc.ac.uk).

³⁸ <http://openidp.org/>

Call V – Virtual Organisation Management Tools and Services

Summary

- E95. JISC invites proposals for projects in the following areas:
- a) Tools for the establishment of Virtual Organisations (VOs)
 - b) Services and User Identities (Uis) for management of VOs
 - c) Federation membership models for VOs
 - d) Delegated authorisation
- E96. It is envisaged that funding of £525,000 be available over two years from the date of award. This will comprise a mix of bigger projects that aim to embed and establish in areas where existing work has been done and small projects that demonstrate and produce papers and reports with a view to identifying later larger projects. Wherever possible, the aim will be to produce 'service-ready' outputs³⁹ from projects. JISC reserves the right not to commission the full amount of funding under this call, and to issue a subsequent call to address any remaining gaps.
- E97. All projects should start in March 2007 and finish by the end of March 2009.

Terms of reference

- E98. It is envisaged that the Virtual Organisation Management Tools and Services area will consist of around five projects of approximately £100,000 each making a total of around £525,000 for this area. The arrival of SAML 2.0⁴⁰ and the potential new capabilities of Shibboleth within this area⁴¹ mean that it is likely that projects focusing on software outputs within this area will be split into two phases. The first will be to consolidate and review existing national and international developments on VOs (such as myVocs,⁴² Grouper⁴³ and Signet⁴⁴ and related initiatives such as eduGAIN⁴⁵) and take into account the potential of new developments and the second phase will be to produce demonstrators that take account of the new capabilities within SAML 2.0 and Shibboleth. Given the focus of the programme, projects on grid-based virtual organisations would be of particular interest. Priority will be given to tools that move the agenda forwards and not simply new ways of carrying out the same tasks (creating lists of people etc) that do not interwork.
- E99. The areas to be covered by these projects are:
- Tools for the establishment of VOs:
 - Research and demonstrator project(s) that incorporate existing solutions such as DyVOSE,⁴⁶ research new ones and build on work already done on issues such as attribute release and mapping (eg ShARPE⁴⁷ under the MAMS project and the work Kennisnet has done with Digidocodes)
 - Services and UIs for management of VOs:

³⁹ See 'Other Considerations' for a full description of the definition of 'service ready'.

⁴⁰ www.oasis-open.org/committees/tc_home.php?wg_abbrev=security

⁴¹ <https://authdev.it.ohio-state.edu/twiki/bin/view/Shibboleth/ShibTwoRoadmap> and www.jisc.ac.uk/index.cfm?name=event_showcase_0706 (see Chad LaJoie presentation).

⁴² <http://lab.ac.uab.edu/node/view/1322>

⁴³ <http://grouper.internet2.edu>

⁴⁴ <http://middleware.internet2.edu/signet/>

⁴⁵ A good introduction to eduGAIN can be seen at

www.terena.nl/events/tnc2006/programme/presentations/show.php?pres_id=202

⁴⁶ <http://labserv.nesc.gla.ac.uk/projects/dyvoze/>

⁴⁷ <http://mams.melcoe.mq.edu.au/wiki/display/MAMS/Shibboleth+Attribute+Release+Policy+Editor+%28ShARPE%29>

- Research and demonstrator project(s) to take existing work to an exemplar service in liaison with the Open Middleware Infrastructure Institute UK (OMII-UK),⁴⁸ the National Grid Service (NGS)⁴⁹ and relevant JISC services. This would work in a similar way to the National Centre for Text Mining (NaCTeM)⁵⁰ and with a similar rationale of encouraging the community to try out various scenarios then resolving any issues so that the service is ready to go to production. See also E87 under 'Other Considerations'
- Federation membership models for VOs:
 - Community engagement project(s) to gain consensus on appropriate federation membership models for VOs, primarily within the UK but also incorporating international developments
- Delegated authorisation:
 - Research and demonstrator project(s) to establish best methods of delegated authorisation

Further information

E100. All general enquiries regarding this circular should be sent to James Farnhill, Programme Manager, JISC Executive (tel: +44 (0)7766 44 22 59; email: j.farnhill@jisc.ac.uk).

⁴⁸ www.omii.ac.uk

⁴⁹ www.ngs.ac.uk

⁵⁰ www.nactem.ac.uk

Information on specific project areas: Knowledge Organisation and Semantic Services

Call VI – Semantically Coordinating Resources and Services Across Registries

Summary

- E101. JISC invites proposals for projects to undertake work within *Knowledge Organisation and Semantic Services* of the e-Infrastructure Programme.⁵¹
- E102. *Knowledge Organisation and Semantic Services* focuses on exploring, developing and applying semantic grid technologies, semantics-aware services, protocols for the exchange of metadata, and the use of these to automate the creation of service workflows and virtual organisations.
- E103. Funding is available up to a total of approximately £500,000 over two years for around three demonstrators in the use of semantic models for automating research.

Context

- E104. There is a growth of activity in the domain of semantic web and semantic grid services under the W3C, developing ontologies based on Web Ontology Language (OWL),⁵² RDF(S),⁵³ and developing tooling such as Protégé.⁵⁴ This includes OWL-S – an ontology language for services. Within OASIS,⁵⁵ there is already work within the ebXML Technical Committee for metadata languages to describe the legal management and process models, as well as a relatively new activity – the Semantic Framework Technical Committee⁵⁶ – which builds upon the various activities, including WSMO (Web Services Modelling Ontology),⁵⁷ WSML (Web Service Modelling Language),⁵⁸ WSMX (Web Service Execution Semantics),⁵⁹ and AML (Abstract Mapping Language), as used by the Web Services Modelling Toolkit.⁶⁰ NISO⁶¹ and ISO⁶² activities are similarly supporting work in related standards areas.
- E105. Concurrently, the importance of standards, such as the Dublin Core⁶³ and Simple Knowledge Organisation System (SKOS)⁶⁴ to the library and information environment community has been increasing. Within the UK there are already key investments in information resources and data centres by JISC, including MIMAS,⁶⁵ EDINA,⁶⁶ and the broader activities of UKOLN⁶⁷ and CETIS⁶⁸ which support the development and implementation of these standards, as well as major initiatives in integrated information environments, for example, the Information Environment Service Registry

⁵¹ www.jisc.ac.uk/programme_e-infrastructure

⁵² www.w3.org/TR/owl-ref/

⁵³ www.w3.org/RDF/

⁵⁴ <http://protege.stanford.edu/>

⁵⁵ www.oasis-open.org/

⁵⁶ www.oasis-open.org/committees/

⁵⁷ www.wsmo.org/

⁵⁸ www.wsmo.org/wsml/

⁵⁹ www.w3.org/Submission/WSMX/

⁶⁰ <http://wsmt.sourceforge.net/>

⁶¹ www.niso.org.uk/

⁶² www.iso.org/

⁶³ <http://dublincore.org/>

⁶⁴ www.w3.org/2004/02/skos/

⁶⁵ www.mimas.ac.uk/

⁶⁶ <http://edina.ac.uk/>

⁶⁷ www.ukoln.ac.uk/

⁶⁸ www.cetis.ac.uk/

(IESR)⁶⁹ and High Level Thesaurus (HILT)⁷⁰ and the recently published JISC reviews on Shared Infrastructure for the JISC Integrated Information Environment⁷¹ and the State of the Art Terminology Service and Technology⁷². Outside of JISC, there are other initiatives to enable semantic interoperability across different information models, such as the Universal Data Element Framework,⁷³ ISO 11179 Metadata Registries,⁷⁴ and various file format registries such as PRONOM⁷⁵ and the Global Digital Format Registry.⁷⁶

- E106. Semantic Web standards have also had a major influence on grid architectures. The UK Research Councils⁷⁷ are making investments in these areas. For instance, the e-Science community and the Open Middleware Infrastructure Institute (OMII-UK)⁷⁸ are involved in OGSA-DAI,⁷⁹ which is critically dependent on semantics, to support the next generation of grid services. Other projects within the UK e-Science Programme have developed mechanisms for describing arbitrary binary data structures using XML, such as the BinX description language.⁸⁰ The EU Next Generation Grids expert group envisages Knowledge Oriented Utilities as the core of the next generation of grid services.⁸¹
- E107. The JISC Support of Research Committee has been investigating ways of expanding the benefits of such developments in the Semantic Grid and Autonomic Computing Programme.⁸² Under this programme, among the projects funded are CO-ODE⁸³ and eBank UK.⁸⁴ The CO-ODE project (joint with the EPSRC HyOntUse⁸⁵) aims to provide support for communities interested in OWL by developing materials, enhancing tools, and looking at some of the theoretical problems to help form usable solutions. e-Bank UK brings together chemists, digital librarians and computer scientists in an interdisciplinary collaboration, which explores the potential for integrating research datasets into digital libraries by using common technologies such as the Open Archives Initiative Protocol for Metadata Harvesting (OAI-PMH).⁸⁶
- E108. Another important initiative of the Committee has been the National Centre for Text Mining (NaCTeM)⁸⁷ at the University of Manchester, which is looking to evaluate and provide a range of services for researchers to effectively search across large databases of contextual resources using semantic grid tools. In the first instance, they are collaborating with the biomedical community, with current plans to further testbed work and to understand how their findings can extend out into tailoring useful tools for arts and humanities researchers.

Terms of reference

- E109. The intention of the call is to build on existing activity within the UK and internationally as outlined above and by seeking to address specific areas for demonstration, namely semantic models for automating research.

⁶⁹ <http://iesr.ac.uk>

⁷⁰ <http://hilt.cdli.strath.ac.uk/>

⁷¹ http://www.jisc.ac.uk/Shared_Infrastructure_Services_Review_Sep_06

⁷² http://www.jisc.ac.uk/Terminology_Services_and_Technology_Review_Sep_06

⁷³ www.undef.org

⁷⁴ <http://metadata-standards.org/11179/>

⁷⁵ www.nationalarchives.gov.uk/pronom/

⁷⁶ <http://hul.harvard.edu/qdfr/>

⁷⁷ www.rcuk.ac.uk

⁷⁸ www.omii.ac.uk

⁷⁹ Open Grid Services Architecture Data Access and Integration: www.ogsadai.org.uk/

⁸⁰ www.edikt.org/binx/

⁸¹ Group NGGE. Future for European Grids: GRIDs and Service Oriented Knowledge Utilities: Next Generation Grids; 2006.

⁸² www.jisc.ac.uk/programme_semantic_grid.html

⁸³ www.co-ode.org

⁸⁴ www.ukoln.ac.uk/projects/ebank-uk/

⁸⁵ www.co-ode.org/about/hyontuse.php

⁸⁶ www.openarchives.org/OAI/openarchivesprotocol.html

⁸⁷ www.nactem.ac.uk

- E110. Whilst a key aim of service-oriented and grid computing is that applications can be built by composing a set of autonomous services, currently, setting up virtual organisations⁸⁸ and service-based machine-to-machine workflows is labour intensive. The task of discovering and composing the appropriate services for meeting the functional and non-functional requirements of an application is not always straightforward. This is currently difficult as the only computer-processable description of a service (typically WSDL⁸⁹) only provides information about the structure of the messages to be exchanged but is insufficient to fully understand the functional and non-functional properties of a service; and the services being composed to form an application are often designed, developed, owned, deployed and managed by different organisations, so there is no single source of expertise on the behaviour of the services, or their combined interactions.
- E111. If these processes are to be automated, enhanced semantics are needed in addition to currently available service metadata. Metadata are needed that will capture a set of functional and non-functional facets of the service, including the externally visible process model of a service, contracts, data semantics, policies, etc. Associated tooling will be needed to assist service designers in creating (or automatically generating), publishing, managing, storing, discovering and evolving such metadata for the services that they develop. Tooling will also be required to support application builders in discovering services that meet given criteria and in deriving the overall semantics of a service-oriented application. The vision is one where grid applications are 'configured' from a set of services using simple and declarative languages, and with appropriate tool support. The aim is that users should require little or no knowledge about the underlying distributed computing platform.

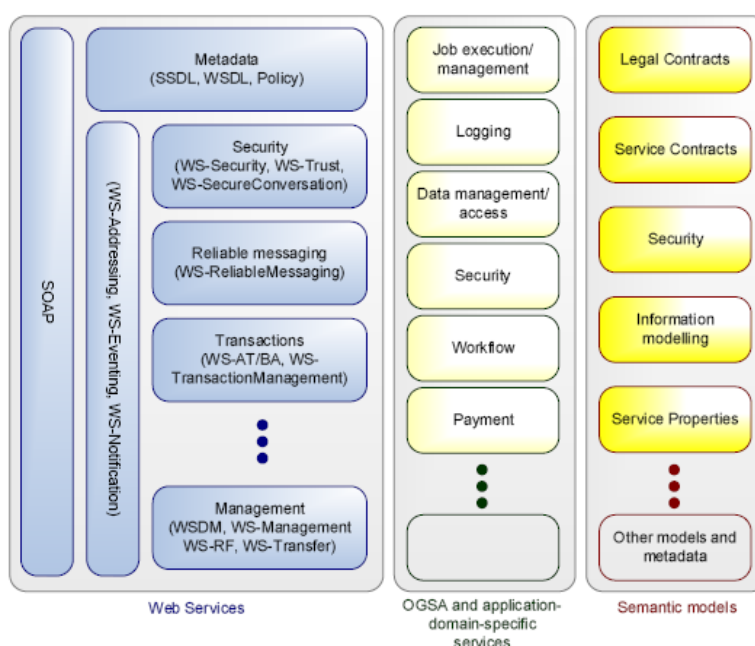


Figure 1:⁹⁰ *Modelling for service-oriented applications*

- E112. A semantic model of a service provides a high-level abstraction and platform-independent representation of a set of related service properties. A set of models will be needed to realise the model-driven approach and they describe a service's functional and non-functional properties including:
- Security

⁸⁸ The Anatomy of the Grid – Enabling Scalable Virtual Organisations

www.globus.org/alliance/publications/papers/anatomy.pdf

⁸⁹ www.w3.org/TR/wsdl

⁹⁰ Goble C, Kuo D, Parastatidis S, Watson P. *Building large-scale, service-oriented distributed systems using semantic models*. JISC Support for Research Committee. December 2005.

http://www.jisc.ac.uk/Grid_Standards_above_OGSA

- Static (eg memory and number of CPUs) and runtime (eg load) properties
- Legal contracts
- Management contracts
- Information modelling, and
- Service contracts (eg describing a service's exposed functionality to the network)

- E113. The model-driven approach aims to enable end-users and developers to work at a higher level of abstraction than today, simplifying the development, maintenance and evolution of service-oriented and grid applications. Models need to be as simple as possible but not simplistic, which is extremely difficult to achieve. A model needs to be sufficiently expressive to describe the essential properties of a service. Simple properties should be described simply while more complex properties require a proportionally greater effort. Overly complex models are as detrimental as overly simplistic ones in building robust applications. Even when they are standardised, it will often be difficult to achieve interoperability and expensive to implement, maintain, deploy and manage.
- E114. Information modelling is of particular interest. Within e-Science we have already seen large-scale collaborations whose core is shared information and who must therefore develop their resources collaboratively. This involved the creation of both the primary data and the meta-data for describing it. The demand for shared 'ontologies' and metadata standards is therefore pervasive across communities often crossing traditional 'silos', thus requiring the need to translate and bridge between these different communities. We are also seeing the blurring of the traditional boundaries between data and information, eg between primary and derived data, publications, and new forms of scholarly output and a move to increased data sharing supported by official policy at all of the Research Councils, producing pressure to bridge the gap between metadata for services, data, and the published literature, both with respect to content and with respect to security, custodianship, long-term preservation and rights of use. This area involves the close collaboration of both research domain-specific experts but also grid and e-Science technology experts and information science and digital library experts.

Scope of Funded Activity

- E115. Projects are invited to explore these issues involved in providing semi- and fully automated support for semantic models and by building upon existing work within JISC and elsewhere.
- E116. Bidders **MUST** address **either** Area A *or* Area B (as described below) in the exploration of the identified issues, **and** in addition, at least two of the Supporting strands (as described in paragraph E117):
- A** Build upon the existing JISC e-Infrastructure and Information Environment, and demonstrate the semantic integration of resources and services from existing JISC services, such as the IE Service Registry (IESR), data and information services (such as datasets at MIMAS, EDINA, e-Print archives, etc), e-infrastructure and grid services (eg National Grid Service⁹¹), and advisory services (eg Digital Curation Centre,⁹² OMII-UK)

OR

B Look at data issues crossing the traditional library and e-Science domains to bridge the gap between metadata for services, data, and published literature, both with respect to content and with respect to security, custodianship, long-term preservation and rights of use. In particular, involve partnership of grid/e-Science

⁹¹ www.ngs.ac.uk

⁹² www.dcc.ac.uk

technology experts with domain researchers and experts from the information environment and digital library communities

E117. Supporting strands:

- Develop simplified tools for collaborative development of unambiguous semantic models describing both services and content (both binary and textual data), particularly tools to bridge the gap between 'human oriented' and 'machine oriented' metadata
- Develop well defined, simple and unambiguous semantic models that describe a facet of a service's functional or non-functional properties
- Develop tooling to support metadata publication and discovery, semantic composition, decomposition and behaviour prediction across multiple registries
- Develop tools and techniques to support the run-time monitoring and evolution of applications, based on the models
- Investigation of existing best practice in service and grid applications engineering, in order to understand how the approaches proposed above could be utilised in order to improve design, implementation and deployment
- Develop tools which integrate with virtual research environments

E118. It is intended that projects should primarily concentrate on the demonstration and integration of existing technology and standards into applications and tools which are useable by the research community rather than developing new technologies and standards or merely demonstrating that technology works. As many of these technologies will be leading edge, proposals should include a risk assessment associated with deriving fit for purpose outcomes within the funding requested.

E119. It is expected that all projects provide advice on the requirements for additional registry or registry annotation services needed for this activity,⁹³ and that projects contribute service genres or definitions, service usage models and other documentation to the e-Framework initiative, as appropriate.

E120. It is further desirable that all projects show evidence of effective involvement in standards development and bridging between metadata, ontology, and standards, including W3C, OASIS, ISO, NISO.

E121. The main vehicle for projects will be in the form of demonstrators, of which around three will be funded under this call up to a combined total of approximately £500,000. The expected duration of projects is a maximum of two years from the date of funding.

Further information

E122. All general enquiries regarding this appendix should be sent to Matthew Dovey (tel: 07876 445 403; email: m.dovey@jisc.ac.uk).

**JISC Executive
September 2006**

⁹³ Whilst projects funded under this call strand are expected to integrate existing registries, additional registry or registry annotation services may be required by this activity – any such required services will be commissioned as required via Invitation to Tenders, and projects under this strand are expected to advise on the requirements for these services.

e-Infrastructure Proposal Cover Sheet

Cover Sheet for Proposals (All sections must be completed)	JISC Capital Programme
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Name of Capital Programme: e-Infrastructure

Programme Strand:
(Please tick ONE BOX ONLY, as appropriate)

e-Research Community Engagement & Support

<input type="checkbox"/> Call I – Barriers to Take-Up of e-Infrastructure Services	<input type="checkbox"/> Call II – Support for Research: Tools & Standards	<input type="checkbox"/> Call III – Use Cases and Service Usage Models
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e-Infrastructure Security	Knowledge Organisation and Semantic Services
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<p>Call IV – Federated Tools and Services</p> <p><input type="checkbox"/> a) Integration of Grid and Shibboleth</p> <p><input type="checkbox"/> b) Developing and Applying n-tier Web Service Architectures</p> <p><input type="checkbox"/> c) Applying existing virtual home for identity solutions</p>	<p>Call V – Virtual Organisation Management Tools and Services</p> <p><input type="checkbox"/> a) Tools for the establishment of VOs</p> <p><input type="checkbox"/> b) Services and UIs for management of VOs</p> <p><input type="checkbox"/> c) Federation membership models for VOs</p> <p><input type="checkbox"/> d) Delegated authorisation</p>	<p>Call VI – Sematically Coordinating Resources and Services Across Registries</p> <p><input type="checkbox"/> a) Area A – integration of Resources and Services from Existing JISC Services</p> <p><input type="checkbox"/> b) Area B – Metadata for Services, Data, and Published Literature</p>
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Name of Lead Institution:

Name of Proposed Project:

Name(s) of Project Partner(s):

Full Contact Details for Primary Contact:

Name:
Position:
Email:
Address:

Tel:
Fax:

Length of Project:

Project Start Date: _____ **Project End Date:** _____

Total Funding Requested from JISC:

Funding Broken Down over Financial Years (April - March):		
Apr06 – Mar07	Apr07 – Mar08	Apr08 – Mar09
Total Institutional Contributions:		
Percentage Contributions over the Life of the Project:	JISC	PARTNERS
Outline Project Description		
I have looked at the example FOI form at Appendix A and included an FOI form in the attached bid (Tick Box)	YES	NO
I have read the Circular and associated Terms and Conditions of Grant at Appendix B (Tick Box)	YES	NO