

NCRIS Platforms for Collaboration

Interoperation and Collaboration Infrastructure (ICI) Project

Implementation Plan

This document is the Implementation Plan for the Interoperation and Collaboration Infrastructure (ICI) component of the NCRIS Capability for Platforms for Collaboration (PfC). The Implementation Plan is the successor to the ICI Establishment Plan, which covered the Establishment Period from 1 July 2007 to 30 September 2007.

Acceptance of this Implementation Plan by the Commonwealth is a formal milestone in the Commonwealth Funding Agreement between DEST and VPAC, the lead agent for the ICI Project. This Implementation Plan complies with the terms of the Commonwealth Funding Agreement. The Implementation Plan covers the Implementation Period from 1 October 2007 to 30 June 2008, and includes milestones and expenses for that period.

Objectives of the ICI Program

The objectives of the ICI Project, as defined in the ICI Project Plan in Attachment A of the Commonwealth Funding Agreement, are to:

1. Establish, operate and provide access to an interoperation and collaboration infrastructure (ICI) and to improve access by researchers to digital repositories, scientific instruments, virtual environments, on-line collaborative interaction and seamless resource sharing in accordance with the NCRIS Principles set out in section one of the NCRIS Roadmap.
2. Expand the facilities, services and user base developed by the grid program of the Australian Partnership for Advanced Computing (APAC).
3. Offer open access to the ICI infrastructure to all researchers undertaking research across NCRIS capabilities as well as researchers accessing other affiliated resources.
4. Under the auspices of AeRIC, operate collaboratively with the other components of the NCRIS Platforms for Collaboration capability.
5. Undertake activities to increase the uptake of ICI facilities and therefore eResearch.

Executive Summary

The partners in the ICI Project have drafted a Joint Venture Agreement to form the Australian Research Collaboration Service (ARCS). The agreement is expected to be signed before the end of October. ARCS is unincorporated collaborative venture to provide long-term, coordinated, national eResearch support to the Australian research community with activities that include, but are not limited to, the provision of the interoperability and collaboration infrastructure and services specified in the ICI Project.

ARCS has established an Executive Committee and a governance structure. A half-time Interim Executive Director (Tony Williams) has been appointed, and a full-time Executive Director is expected to be appointed by the end of October 2007. Most of the other staff are already in place, except for the NeAT development projects, which will not begin until after the end of the Implementation Period.

The ICI Project faces the problem of unifying effort from staff that are geographically distributed, working on very different aspects of the program, and supporting users in widely varying research disciplines. A project management structure has been proposed that aims to address these problems and ensure that the staff are working in a coordinated way and communicating effectively. Note that this structure will need to be approved by the new Executive Director, who may want to adopt a different approach to the project management structure.

The Operations Support component will be managed by an Operations Manager who will be responsible for all operational services. This component has three teams, each with a team leader:

- Systems Administration – software, middleware and services installation, maintenance and support
- Data Collaboration Services – interoperable data storage and movement services and support
- User Services – deployment and support of particular national services

The aim is to have one person at each partner site in each of the first two teams, while User Services are national in scope and typically involve a single person who could be located anywhere. The teams have a collaborative web space and regular meetings via Access Grid.

User Support and NeAT projects will be focussed on a wide variety of discipline areas and technologies, so it is difficult and probably not very useful to bring all these staff together in a single coherent team. However, there must be detailed oversight of these activities to ensure that they are effectively utilizing ICI services and that commonalities in the projects are identified. It is proposed that a half-time Projects Manager with expertise in eResearch applications and technologies directly oversee these activities, rather than the Executive Director, which is a variation from the Project Plan.

Many of the standard ICI services and middleware for interoperable job submission and data movement are already operational at the ARCS partner sites, as are the virtual organization services that allow authorized, collaborative sharing of resources. These are the core operational services of Grid Australia, formerly known as the APAC Grid. During the Implementation Period, current core services will be upgraded, improved and made more robust, and some new services will be investigated and possibly deployed (or deployed more widely), including alternative middleware (such as gLite and Condor), and metascheduling solutions for automatically selecting the compute resource where a job will be run.

During the Implementation Period there will be increased focus on data storage and movement services, particularly for NCRIS capabilities. The Data Collaboration Services teams will deploy a variety of data services that are required by different research groups, including SRB, SRM, LDR, OPeNDAP and gridFTP, and assist user groups with their data storage and data movement requirements. Not all of these data services are required at all ARCS partner sites – it depends on what type of data is stored at the site.

There will also be increased focus on collaboration tools such as wikis and shared web spaces, collaborative software development environments, and videoconferencing. ARCS will consult with other groups with expertise in this area (including MAMS, AAF, ARCHER, AARNet) to create working groups that will investigate available options and provide recommendations on which of the many collaboration tools and videoconferencing solutions should be supported and promoted by ARCS. This will be done by the end of 2007 and ARCS and AeRIC will review the recommendations and decide on a strategy. It is expected that the collaboration tools that are supported will make use of the AAF authentication, authorization and virtual organization services.

Effort is also being assigned to provide client and portal toolkits that will make it easier for application developers to utilize ICI services, as well as tools to make it easier for researchers to use the infrastructure, such as generic job submission portals, and customized portals for particular applications and discipline areas.

General user support will be provided by the Operations team including an ARCS Helpdesk and information, user guides and FAQs for the ICI services, training material and training courses. Some of this material already exists on the APAC Grid web site and twiki. During the Implementation Period it will be migrated to the ARCS and Grid Australia web sites, and the content will be reviewed, improved, and better organized.

A national ARCS helpdesk service has been designed based on the Request Tracker (RT) software, which is currently used by a number of ARCS partners for managing their own helpdesk services. The system has been set up at VPAC and is currently functional, although the process for which staff will handle which queries is still evolving and being refined. The ARCS Helpdesk service will be advertised on the new ARCS and Grid Australia web sites as they are developed. Long-term records will be kept of all helpdesk requests to help generate FAQ lists and indicate problem areas. In addition to providing helpdesk support at a national level, members of the ARCS Operations Team can also provide hands-on, face-to-face assistance to local users.

The Grid Operations Centre (GOC) provides a set of software for monitoring the status and usage of the compute infrastructure, and reporting it on the Grid Australia web site. Work during the Implementation Period will include developing an automated monitoring system for all ICI services using INCA, which is the standard approach used in major international grids. Another activity will be to determine performance metrics for other services, including data services and user services, and provide additional information about these on the GOC web site.

The process for specifying developmental projects in ICI, through the National eResearch Architecture Taskforce (NeAT) and AeRIC, has yet to be finalized. NeAT has convened and had two initial meetings, and it is expected that the process for specifying and managing NeAT projects will be decided by the end of 2007. The first round of projects will be included in the first ICI Business Plan in March 2008 and the projects will start 1 July 2008. A half-time person (Paul Coddington) will be appointed for five months, using NeAT funds, to assist with the development of proposals and project plans for NeAT projects.

In the Establishment Period, a small number of “proto-NeAT” projects were started and will continue until end of 2007. The first-round proto-NeAT projects were designed to ensure that existing projects that had been developing important ICI capabilities were continued, and that staff with expertise and experience in eResearch technologies and applications were not lost before the NeAT projects began. A second round of proto-NeAT projects with the same objectives will be funded for the first half of 2008. These projects will be more closely aligned with the initial suggestions for projects that are coming from NeAT. The second round of proto-NeAT projects will be decided by early November 2007 and will run from 1/1/08 until 30/6/08.

AeRIC has identified several NCRIS capabilities and other research disciplines as priority areas for ICI, since they are expected to be major users of ICI services. ARCS management have had discussions with key representatives from these groups, and ARCS partners are already engaging with local users involved in these areas. Most of the User Support, proto-NeAT and data support efforts are being focussed on these areas.

The main risk in this project is that the ICI services are not extensively used by researchers, because they are too hard to use or don't provide the services that researchers want. This is being addressed through an ARCS emphasis on quality user-oriented service, by the strong engagement with users in the User Support activities and NeAT/proto-NeAT projects, and the increased focus on data services and collaboration tools that are expected to have significant and widespread demand. Another risk is that there may not be enough skilled people to achieve the goals of the project. This is not likely to be a problem during the Implementation Period, since most of the staff are already in place. However it is potentially a problem once the NeAT projects begin.

Overall, good progress has been made during the Establishment Period and the project is on track to deliver the expected outcomes during the Implementation Period.

Status of Project

The three key activities of the Establishment Period, as specified in the Commonwealth Funding Agreement, were:

- Negotiation of a Joint Venture Agreement, or Partner Agreement, between the ICI Partners specified in the Commonwealth Funding Agreement;
- Development of the Implementation Plan;
- Operation Support to ensure the continuous operation of all existing grid related services across all sites.

The Implementation Plan has been developed by Paul Coddington, the ICI Associate Director, in consultation with Rhys Francis (Director of NCRIS PfC), David Bannon (ICI Operations Manager), Tony Williams (Interim ICI Director), the interim ICI Executive Committee, Lindsay Hood (Director of the APAC Grid Program) and representatives of the major ICI user groups described in Section 1.1. A review of current staff, services and projects was undertaken and was used as input to the Implementation Plan.

The Joint Venture Agreement, hereafter referred to as the ‘Collaboration Agreement’ is nearing completion and is being readied for signing. It establishes a joint venture called the Australian Research Collaboration Service (ARCS), which is responsible for implementation of the ICI project.

Australian Research Collaboration Service (ARCS)

The Australian Research Collaboration Service (ARCS) is an unincorporated collaborative venture to provide long-term eResearch support to the Australian research community with activities that include, but are not limited to, the provision of interoperability and collaboration infrastructure and services. During the Interoperation and Collaboration Infrastructure (ICI) Funding Period, this will be achieved in a manner that is consistent with the aims of the National Collaborative Research Infrastructure Strategy (NCRIS) Programme, and specifically the Platforms for Collaboration’s (PfC) ICI programme. The Collaboration is intended to be an enduring arrangement for the national delivery of these services well into the future and certainly beyond the ICI Funding Period. Further details are available in the Collaboration Agreement.

Since ARCS is the joint venture that has been established to implement the ICI Project, the ARCS name will be used in the Implementation Plan to refer to some of the organizational and operational entities for which the term ICI was used in the ICI Project Plan and Establishment Plan. For example, this document refers to the ARCS Executive Committee and ARCS Executive Director rather than the ICI Executive Committee and ICI Director.

The governance and project management structures and processes of ARCS, and in particular how they relate to the delivery of the ICI project, are described in Section 2.

User Engagement

During the Establishment Period, the ARCS partners and ARCS management have had discussions about ICI with representatives from many different research communities and NCRIS capabilities. In consultation with the PfC Director, user communities that have a clear need for ICI services have been identified and are listed in Section 1.1. Researchers from many of these groups are already using ICI services, most as a result of APAC Grid Applications projects or projects funded by the ARC eResearch Support Initiative. Most of these existing users are being supported by User Support activities or “proto-NeAT” projects, as described in Section 1.

Some of the priority discipline areas currently have very few researchers using ICI services on a regular basis. However, discussions with representatives from these disciplines has indicated that in all cases, the number of researchers making use of ICI services will be significantly increased as the services become broader in scope, easier to use, more widely known, with more focus on data services and collaboration tools, and become integrated into the standard research practice in these areas.

Status of Operational Support

The operation of existing operational grid services has been continued and enhanced during the Establishment Period, under the leadership of the Operations Manager, David Bannon.

Below is a summary of the status of operational services and support efforts, using the service titles specified in the Appendix A1.

Service	Status	Comments
Systems Level Services	Functional and in Use	Exists at all partner sites and some other organisations. Subject to continuous developments.
Authentication Services	Functional and in Use	International Approved, extensively used by HPC, Data and (the rudimentary) Collaborative activities
Authorisation Services	Functional and in Use	Used by a significant proportion of Grid HPC users.
Data Movement and Access Services	Some activities functional, much under development.	Some services such as OPeNDAP for Oceanographic Data are extensively used. Some data movement services are an essential part of other services such as Job Submission.
Job Submission Services	Functional and in Use	Used by a wide range of science users at sites across Australia.
Accounting Services	Functional and in Use for some aspects	Fully operational for HPC, limited for Data, other areas under development.
Monitoring Services	Some Functional and in Use	There remains quite a lot to be done however in meeting specific needs.
Information Services	Some Functional and in Use	System is functional but the amount and quality of resource information varies between sites. Quite a lot remains to be done in meeting specific needs.
Demonstration and Training Activities	Operational	There has been a number of quite successful training courses delivered in an ad hoc manner.
Portal and Application Creation Services	Functional and Used	There is a lot of activity happening in this area and significant progress is being made. ARCS will focus this activity on particular productive areas over time.
Collaboration Services	Under Investigation	Some tools are already being used internally by ARCS, however ARCS and end users need to understand these issues a lot better than at present. Some areas are already operational, for example, Access Grid.
User Support Services	Functional and Used.	There are a number of (currently not very cohesive) activities taking place and a large number of researchers are already benefiting from this service.

Status of Milestones for the Establishment Period

July 2007: Initial engagement with user communities; Workshop with selected NCRIS capabilities

August 2007: Workshop with selected NCRIS capabilities

Sept. 2007: Workshop with potential Affiliates and selected NCRIS capabilities

All of the ARCS partners have been engaging with researchers in their region or organization who are involved in NCRIS capabilities or major national research collaborations that might be supported by PfC, as well as some potential affiliates such as ANSTO. The ARCS EC and Management Team have also had discussions with key representatives of most of these groups. We have decided to postpone having workshops until the Executive Director is appointed, and the NeAT process is clarified so that we can work on developing potential NeAT projects.

July 2007: Formal ICI Support Desk established

Design and planning of the helpdesk process and the software to be used to manage helpdesk queries was completed in July. Implementation of the system was stalled pending the Joint Venture Agreement and the planning for migrating existing user support information and to the new ARCS website. The helpdesk system, based on Request Tracker (RT) software, has now been deployed at VPAC and should be operational in early October.

August 2007: Workshop to define implementation plan goals

Weekly meetings of the ARCS EC have been held during the Establishment Period to discuss the goals for ARCS in the Implementation Period and beyond. These goals have been encapsulated in the Joint Venture Agreement and the Implementation Plan.

Sept. 2007: Data Movement and Access Servers installed

ICI data servers have been installed and are operational on 7 of the 9 national grid gateway sites. These provide standard data movement services (e.g. gridftp) and a standard interface to access to data at each site in the national grid. Some sites have also deployed data storage and management services such as SRB, dCache and OPeNDAP.

Sept. 2007: Propose and agree ICI governance arrangements

The governance arrangements for ARCS and the ICI project have been agreed and are described in the ARCS Joint Venture Agreement and in this Implementation Plan.

Outlook

The initialization process for the ICI project is almost complete, with the Joint Venture agreement close to being finalized, a governance and management structure in place, the organization of project teams with team leaders, almost all of the staff already in place, and an Executive Director soon to be appointed. The financial position is sound, with the project operating within budget.

Many services are already operational and in use, and there has been some initial engagement with NCRIS capabilities and other user communities, which has been very positive. Good progress has been made during the Establishment Period on improving ICI services and support, particularly in approaches to making the services easier to use and more robust, and providing improved functionality. There has also been an increased focus on services with wider applicability, particular data storage and movement services and collaboration tools.

There has been some delay in initiating the NeAT development projects, however there has been significant progress on this in the past few weeks. Overall, the project is on track, and there seem to be no major impediments to delivering the proposed interoperation and collaboration infrastructure, services and support; assisting the target NCRIS capabilities and research communities; and significantly increasing the number of researchers that are benefiting from ICI services over the next few years.

1. Research Infrastructure

As described in the ICI Project Plan, the ICI Project will provide the inter-operation services that allow distributed, networked computing and data resources to appear to a user as an integrated, large virtual system that inter-operates seamlessly. The Project will also provide key collaboration services that support researchers participation in distributed research teams and projects. The Project will transition the pre-existing APAC grid program and services to the new ICI component. Building from this, it will eventually provide for on-demand, ubiquitous access to remote computers, digital repositories, scientific instruments and sensor networks.

As specified in the Commonwealth Funding Agreement, there are three groups of activities in the ICI component of NCRIS Platforms for Collaboration:

- Operational Support
- User Support
- Development Projects (NeAT)

Each of these is addressed in a separate subsection below. More information about the motivation for each of these components and what they are expected to provide is available in the NCRIS Pfc Investment Plan and the ICI Project Plan.

Much of the work in the ICI project is a continuation and expansion of the APAC Grid Program, which developed the first national grid computing infrastructure in Australia, known as the APAC Grid. The provision of this national grid infrastructure is being continued by ARCS under the new name Grid Australia. ARCS will also provide additional collaboration tools and services that are distinct from this grid computing infrastructure.

1.1 Target User Communities

The infrastructure and services provided by the ICI program are used by researchers from a variety of discipline areas, however some research disciplines and NCRIS capabilities have a greater and more pressing need for this infrastructure. ICI will therefore mainly focus much of its effort on particular research areas and NCRIS capabilities, particularly in the data services and user support activities and the NeAT development projects. ICI will require some in-kind effort from the user community for dedicated user support and development projects, to ensure that ICI effort is being focussed on communities that are committed to using the infrastructure and services.

In the Implementation Period, data services, user support and development activities will focus mainly on the following NCRIS capabilities, which already use ICI services or have a recognized need for these services:

- 5.1 Biomolecular Platforms
- 5.3 Characterization
- 5.10 Astronomy
- 5.12 Integrated Marine Observing System (IMOS)
- 5.13 Structure and Evolution of the Australian Continent

The following NCRIS capabilities will also have a need for ICI services but are not yet at the point where they can effectively engage with the ICI program.

- 5.2 Integrated Biological Systems
- 5.8 Biosecurity
- 5.11 Australian Environmental Observation Network (AEON)

During the Implementation Period, the ARCS Executive Director and Projects Manager will discuss requirements and potential future ICI activities with representatives of these capabilities.

There are a number of research disciplines that are already significant users of eResearch infrastructure and services but are not directly related to NCRIS capabilities, although they may be represented by large national and international research collaborations, including ARC Research Networks. These include:

- Climate modelling
- Computational chemistry
- Earth System Science
- High-energy physics
- Gravity Wave (LIGO and ACIGA)

ICI will also focus on supporting major collaborative research efforts in these areas.

1.2 Operational Services and Support

Operational Support activities are focussed on the specification, deployment, maintenance and support of the interoperation and collaboration infrastructure and services. This also encompasses some ongoing development activity, for example to package up software to make it easier to deploy at all ARCS partner sites, to fix problems or provide user-requested enhancements to existing services, or make them easier to use. This development effort is at a much shorter time-scale than the NeAT projects, days or weeks rather than years, and driven by operational needs and current user requirements rather than the longer-term strategic goals of NeAT development projects.

The ARCS Executive Director and Operations Manager will manage the Operation Support activities. The Operations Manager will be responsible for managing the provision of operational services.

Operations support staff are categorized in three groups:

- **Systems Administration** – responsible for the installation, configuration, maintenance and management of interoperation and collaboration software and middleware at the ARCS partner sites, and the provision of helpdesk support and assistance to users of this infrastructure;
- **Data Collaboration Services** – responsible for the deployment and operation of interoperable data storage and data movement services and optimising the performance of data transfer;
- **User Services** – responsible for assisting Systems Administrators in the deployment and operation of specific services and providing national expertise, documentation, helpdesk support, and user support for those services.

Each group has a nominated ‘Team Leader’ who is responsible for coordinating the activities of the staff in that group, organizing and running team meetings (using Access Grid videoconferencing, with occasional face-to-face meetings), and providing reports to the Operations Manager and Executive Director. The Operations Manager is responsible for ensuring the continuing operation of all operational services, and overseeing the activities of the staff working on operational support.

The Operations Support staff are mostly ongoing employees of the ARCS Partners who have been in place since the beginning of the Establishment Period. Most have expertise and experience in providing eResearch services and support that was developed during the APAC Grid Program. Details of the operations support staff are provided in Appendix A3.

The operational services currently provided by ARCS are outlined in Appendix A1.

During the Implementation Period, many of these services will be enhanced, and further services will be deployed and supported under ICI operations. The focus will be on services such as collaboration tools, videoconferencing, and data management support that have broad applicability across many research disciplines and will provide increased uptake of ICI services and wider engagement of ARCS and ICI with research communities. More effort will also be focussed on providing portals, client tools, documentation and helpdesk support to make the infrastructure easier to use for both developers and researchers. Some of the changes that are planned are described below.

Job Submission Services

Job submission services provide a standard grid job submission interface to high-performance computing facilities hosted by ARCS partners. Currently this is done using VDT and Globus Toolkit version (GT4). Some sites are also supporting gLite and Condor.

During the Implementation Period, there will be further investigation to determine applications and user groups that are using (or could use) gLite and Condor, and to develop plans for possibly deploying them more widely. In the case of gLite, this will be done in conjunction with a proto-NeAT project on the use of gLite for high-energy physics.

Another area that is being investigated is possible solutions for metascheduling of jobs, i.e. automatic selection of the computer that the job will run on), such as Gridway and GridGateway. gLite and Condor also provide this functionality.

Expected outcomes during the Implementation Period:

- Development of a plan for gLite deployment, and trial deployment of gLite at one of the ARCS partner sites [Jan 2008];
- Investigation of Condor and development of a plan for supporting it (or not) [Mar 2008];
- Provide solutions for metascheduling of jobs [June 2008].

Data Collaboration Services

ICI data services support research collaborations in the storage, movement and sharing of data across multiple data centres throughout the country. All of the ARCS partners provide regional data centres, with large-scale data storage resources (summarized in Appendix B) that are used for storing a wide variety of research data. Many of the NCRIS capabilities and other disciplines listed in Section 1.1 are aiming to use these resources for storing large-scale data sets.

In recognition of the increasing importance placed on managing research data, in particular the enormous amount of new data that will be generated by the NCRIS capabilities, effort has been reallocated (primarily from User Support) to the ICI data services team. The team now has members from almost all of the ARCS partners, and it is expected that the team will include all partners when the budget is revised after the Executive Director is appointed and a decision is made about the next round of proto-NeAT projects.

The aim is to build a coordinated, national team that will provide a suite of standard, interoperable data storage and data movement services at the regional data centres provided by each ARCS partner. The team will also work to engage and assist NCRIS capabilities and other major research collaborations in utilizing these services. Some disciplines such as astronomy and earth systems science are already major users of ARCS data services. Initial discussions have indicated that most of the other target NCRIS capabilities and major discipline areas specified in Section 1.1 have significant data storage requirements and require assistance from ARCS.

In order to clarify the distinction between the data services provided by the ICI and ANDS components of Pfc, and also to distinguish the ICI funded data services from the broader data services offered by the ARCS partners, the name of this team has been changed to be Data Collaboration Services (rather than Data Management, which was the term used in the ICI Establishment Plan). It is expected that this team will work closely with, and complement the activities of, the ANDS component of Pfc.

Expected outcomes during the Implementation Period:

- Development of an ARCS Data Collaboration Services team with representation from each ARCS partner [Oct 2007];
- Deployment of a standard set of data movement services at each ARCS partner site, including gridFTP and LDR [Nov 2007];
- Discussions with all user groups specified in Section 1.1 on data movement and storage requirements [Dec 2007];
- Deployment of various data storage services (including SRB, SRM/dCache, OPeNDAP) at different sites as required [Dec 2007];
- Automated testing and monitoring of data services using INCA [Dec 2007];
- Increase the number of user groups and data sets being supported, including NCRIS 5.3 (ANSTO and AMMRF), 5.12, 5.13 [June 2008];
- Explore options for replication services [June 2008];
- Work closely with ANDS on defining services to be supported by ARCS.

Collaboration Tools

During the Establishment Period, the work on collaboration tools and services has focussed on enabling collaborations (or “Virtual Organizations”) to access shared computational and storage resources on the national grid. This includes services for Authentication, Authorization and Accounting (AAA), grid certificates and proxy certificate services, virtual organization management systems, and how this interfaces to AAF. This work will continue, however there will be a new component which will focus on more general collaboration tools such as web-based shared work spaces, wikis, mailing lists, instant messaging, and shared software development environments.

ARCS has been using such tools to support collaboration between its own operational support teams, and such tools are currently being used by other national eResearch collaborations such as the ARCHER and MAMS projects, including some work on making them accessible using the AAF. There is a plethora of such tools available, however we would like to identify a suite of collaboration tools that ARCS could host and support for research groups. AAF has also been working on developing and hosting collaboration tools that use the AAF.

We propose to set up a working group consisting of ARCS staff and others (e.g. members of NeAT, ARCHER, AAF and MAMS) with interest and expertise in collaboration tools, and ask them to review the existing tools and come up with a recommendation by the end of 2007 for what collaboration tools ARCS should support, and where and how they should be hosted. ARCS should use these tools for its own purposes and provide them as a service for research collaborations. Initially they can be trialled with a small number of research collaborations before they are made more widely available. The decision will be made by ARCS Management in consultation with AeRIC.

Expected outcomes during the Implementation Period:

- Working Group to review existing collaboration tools and provide recommendations [Dec 2007];
- Selection of collaboration tools and services that will be supported by ARCS [Jan 2008];
- Deployment of collaboration services on a trial basis for a limited number of research groups [Mar 2008].

Videoconferencing

ARCS relies heavily on the Access Grid for videoconferencing, with multiple meetings at all partner sites every week. Many research collaborations also use Access Grid, at ARCS partner sites, institutional Access Grid rooms, or from the desktop. Videoconferencing is an important service for collaborative research groups, however it relies on a variety of underlying hardware, software and networking components and is currently non-trivial to install and use, and is rather fragile. Support and assistance for institutions and researchers is currently provided on an ad-hoc basis and there is no real national coordination.

Much of the support for Access Grid in Australia is provided by ARCS partners, particularly QCIF. This includes venue servers and bridges, support and advice for institutions installing Access Grid, regular testing and debugging sessions, and working with network engineers and Access Grid developers to improve the reliability and robustness of the Access Grid. One of the current ICI Proto-NEAT projects is working on improving the reliability and functionality of Access Grid. During the Implementation Period, ICI will provide some funding for operational support for Access Grid and videoconferencing, and a national Access Grid and videoconferencing helpdesk.

As with collaboration tools, we propose to set up a working group to review existing videoconferencing software (including Access Grid, EVO, Agora, Skype, etc) and come up with a recommendation by the end of 2007 for what videoconferencing tools ARCS should support. The decision will be made by ARCS Management in consultation with AeRIC.

Expected outcomes during the Implementation Period:

- Add operations support for Access Grid under ARCS User Services [Jan 2008];
- Working group to review existing videoconferencing software and provide recommendations [Dec 2007];
- Selection of videoconferencing tools and services that will be recommended and supported by ARCS [Jan 2008].

Portals

There will also be a focus on providing tools that make it easier for developers and end users to make use of the ICI services. This will include tools for more easily developing customized job submission portals, and deployment of portals for a variety of widely used applications.

The standard grid portal technologies and software that were used to develop portals during the APAC grid program proved to be difficult to use and it took a long time to develop new portals and customize them for different applications. We are adopting a new strategy for portals that is based on simpler, more widely used technologies such as Java, XML, web services, and Web 2.0 technologies for developing portals. These will be much more easily customized to new applications.

Expected outcomes during the Implementation Period

- Provide a toolkit for easily developing customized portals for grid job submission [Dec 2007];
- Provide a simple generic job submission portal [Mar 2008];
- Assist user groups in developing and deploying customized portals for widely-used applications [June 2008].

ARCS Helpdesk and general user support

A formal helpdesk is being created that will be one central contact point for anyone requiring assistance, advice or access to ARCS services. Primarily based around email and RT, a ticketing system that a number of ARCS partners already have extensive experience in, the system will also support telephone and a number of newer media platforms. The system has been set up at VPAC and information about the helpdesk system will be included in the ARCS web site that is under development.

The Operations Team will direct requests that are not appropriately dealt with internally to other domain experts as necessary, for example, staff of ARCS partners who are not funded by ICI. Long-term records will be kept of all tickets to help generate FAQ lists and indicate problem areas.

In addition to providing helpdesk support at a national level, members of the Operations Team can also provide hands-on, face-to-face assistance to local users.

The range of general user support activities to be undertaken by ARCS will include:

- Provision of helpdesk phone and email support;
- Development of user guides, documentation, FAQs and training material;
- Training courses in the use of technologies and services;
- Assistance to developers and end users in using ARCS services;
- Assistance in developing portals and job submission mechanisms;
- Assistance to researchers in using data storage and data movement services;
- Publishing service outage and interruption information.

A significant amount of information and documentation of ARCS services exists on the APAC Grid web site and twiki, however some of it is not well organised or easy to find, and the quality and level of detail is not consistent across all ARCS services. A significant amount of effort will be required to migrate this information to the ARCS web site and to improve the content and make it more comprehensive.

Expected outcomes during the Implementation Period:

- Provide effective and timely helpdesk support to users, using the new ARCS helpdesk system [from Oct 2007];
- Migrate existing information and user guides about ARCS services to the new ARCS web site [December 2007];
- Provide improved information, user guides and FAQs for all ARCS services [June 2008].

Grid Operations Centre

The GOC provides a number of capabilities for managing and tracking the operational services of Grid Australia, specifically:

- Indicates the status and availability of the grid gateways at each partner site, and a number of other systems including proxy servers and GUMS servers;
- Provides a central means of determining configuration and version information of the components of the above systems;
- Provides date/time stamped 'historical' information of the above systems, useful for fault finding;
- Generates alerts when one of above systems indicates a problem;
- Provides detailed usage records of the high-performance compute resources.

The GOC is complemented by a web site and interactive wiki system that provide distribution points for software, files and information. The web site, <http://gridaus.org.au/> is currently being built using material from a number of sources, particularly the older site <http://www.grid.apac.edu.au/>. The web site is primarily intended for end users and other interested parties.

Developers will be more interested in the twiki and Trac sites. These contain very technical information about building or interfacing to the infrastructure and services.

Expected outcomes during the Implementation Period:

- New web site for Grid Australia [basic content Oct 2007, significant content by Dec 2007];
- Automated monitoring of all services using INCA [Dec 2008];
- Usage information and performance indicators available for most services, including data services [March 2008].

1.3 User Support

As well as the general user support and helpdesk activities provided under Operational Support (as described in Section 1.2), the ICI program also has a User Support component. This is primarily aimed at providing national, discipline-specific support and expertise, in particular user support for discipline-specific services and activities.

User Support activities should configure and package ICI services to meet the needs of affiliates, NCRIS research communities and other important national and international research collaborations that are major users of eResearch services. The User Support staff are expected to provide user support, assistance and expertise at a national level, for the user communities that they are supporting. They may also assist in the management of operational eResearch services that are mainly focussed on particular NCRIS capabilities or research disciplines. User Support staff will also provide a key link between operational infrastructure and services and discipline-specific NeAT development projects. For example, User Support activities will include assisting in migrating tools and services developed in NeAT projects into robust, supported operational services, which are then maintained and supported by User Support staff.

User Support activities are managed by the Projects Manager.

User Support activities for the Implementation Period are targeted primarily at the following research communities:

- Proteomics (NCRIS 5.1);
- Astronomy (NCRIS 5.10);
- Geosciences (NCRIS 5.13);
- Earth Systems Science;
- CSIRO – this includes a variety of user groups.

The User Support staff are mostly ongoing employees of the ARCS Partners who have been in place since the beginning of the Establishment Period. Most have expertise and experience in using and developing eResearch services, and in some cases have expertise in one or more of the discipline areas listed above. Details of the User Support staff are provided in Appendix A3.

Effort allocated to user support projects is typically at the level of 0.5 EFT, with NCRIS capabilities, research groups, ARCS partners or affiliates expected to provide matching effort, although currently this is not a requirement.

The scope of User Support projects, and which communities they support, may need to be revised once the new proto-NeAT projects are determined, and in the business plan for the second year of ICI, once the NeAT projects are determined and the needs of the different user communities become more clear. At that point, more detailed plans for User Support projects will be required.

1.4 Developmental Activities

Development projects will expand the user base, expand the services and expand the facilities supported by ICI. They will develop and prove extensions and additions to the ICI services and capability offerings; assist the integration of affiliate's resources and scientific instruments; and work with NCRIS capabilities and major research collaborations to address their needs for eResearch tools and services.

Expanding the user base

Many development projects will engage with NCRIS capabilities and other scientific disciplines that have a growing need for eResearch infrastructure and services but do not yet have the expertise to make effective use of these resources. Other significant user communities of interest include those in the humanities and social sciences, for which both local and international experience indicates high demand for appropriate eResearch services. The projects will develop eResearch tools, services, workflows and portals that meet the requirements of users in these NCRIS capabilities and research disciplines.

Expanding the services

User groups may request services that ARCS does not currently provide, or NeAT may identify new technologies or standards, or a new generation of middleware or services, that ARCS will need to support in the future. These projects may just involve adopting, deploying, testing and possibly adapting existing software, or may require significant local development effort for customized services.

Expanding the facilities

There are many resources outside of the current ARCS partner sites that should be accessible as part of the national eResearch infrastructure. Some projects will work on integrating these resources into the ICI framework. These include large-scale research data centres such as those in the Bureau of Meteorology, Geosciences Australia and other government agencies; scientific instruments such as the Australian Synchrotron, ANSTO/OPAL, ATNF, SKA and the data gathering networks of AEON and IMOS; and institutional compute resources and data repositories.

NeAT Projects

The National eResearch Architecture Taskforce (NeAT) will recommend development projects, participants and indicative funding allocations for consideration to AeRIC. Note that the ANDS component of PfC will also have development projects recommended by NeAT. Here we are concerned only with ICI projects, although some projects may cut across both ICI and ANDS.

The process for specifying and managing NeAT projects is still under consideration by AeRIC and NeAT. It is expected to be finalized by the end of December 2007, at which point an attachment will be added to the Implementation Plan to describe the process.

Development projects are likely to be of 1 or 2 years duration and it is expected that in-kind support will be received from the participants. The expected outcomes of a development project would be to:

- develop software, tools or services that would become part of the ICI operational eResearch infrastructure;
- assist the target NCRIS capabilities and research disciplines in making effective use of ICI services;
- reduce duplication of effort by developing software, tools and services that can be used across multiple disciplines and NCRIS capabilities.

The ICI Project Plan specifies that a complete set of developmental projects should be provided in the Implementation Plan, however since the NeAT process has not yet been finalized by AeRIC, this is not possible.

Many potential developmental activities have been suggested during consultations with ARCS partners, NCRIS capabilities and other user groups. These are listed in Appendix A2 and will provide some input to the NeAT process.

The Pfc Director has requested that a proto-NeAT project be set up to work on formulating the first round of NeAT projects. This proto-NeAT project will fund a half-time person (Paul Coddington) to work with AeRIC, NeAT, ARCS, ANDS and the target NCRIS capabilities and research communities, to help to identify potential NeAT projects; develop project proposals to be submitted to AeRIC for review and acceptance; and develop project plans to be included into the ICI Business plan due in March 2008. This proto-NeAT project will run from 1 November 2007 to 31 March 2008.

Proto-NeAT Projects

A small number of development projects have been undertaken during the Establishment Period. These “proto-NeAT” projects were agreed by the ICI Interim Director, the Interim EC, and the Pfc Director, in areas that are aligned with the ICI Project Plan. They were designed to ensure that existing projects that were developing important ICI capabilities were continued, and that staff with expertise and experience in eResearch technologies and applications were not lost before the NeAT projects began. The current proto-NeAT projects are:

- Support for a national Nimrod portal and Nimrod development;
- Development of a computational chemistry portal for grid job submission;
- Deployment of gLite to support experimental high-energy physics, and development of a plan and documentation for national deployment;
- Improving the reliability and functionality of Access Grid;
- Bioinformatics portal and workflow development;
- Grid-enabling of bioinformatics sequence assembly tools;
- Proteomics laboratory system;
- Using SRB to provide federated repositories of bioinformatics data sets;
- Developing grid training courses.

The current proto-NeAT projects are scheduled to finish on 31 December 2007, however it is expected that NeAT development projects will not start until 1 July 2008. A second round of proto-NeAT projects to cover the period 1 January to 30 June 2008 will therefore be required. These projects will be determined by AeRIC and ARCS, based on the outcomes of the NeAT meeting held on 26 September 2006, the priority and urgency of required new services, and the need to continue important development projects and retain experienced staff.

The second round of proto-NeAT projects will be formulated over the next several weeks, with a decision expected by early November 2007. Once these projects have been decided, a list of projects and staff to undertake them will be submitted as an attachment to the Implementation Plan, and a revised budget for the Implementation Period, which takes into account these projects, will also be submitted.

2. Governance

The Governance of the ICI Program is specified in Attachment-A-4 of the Commonwealth Funding Agreement. The ARCS Collaboration Agreement specifies governance arrangements for ARCS that conform to these specifications.

2.1 Executive Committee

ARCS is governed by an Executive Committee consisting of

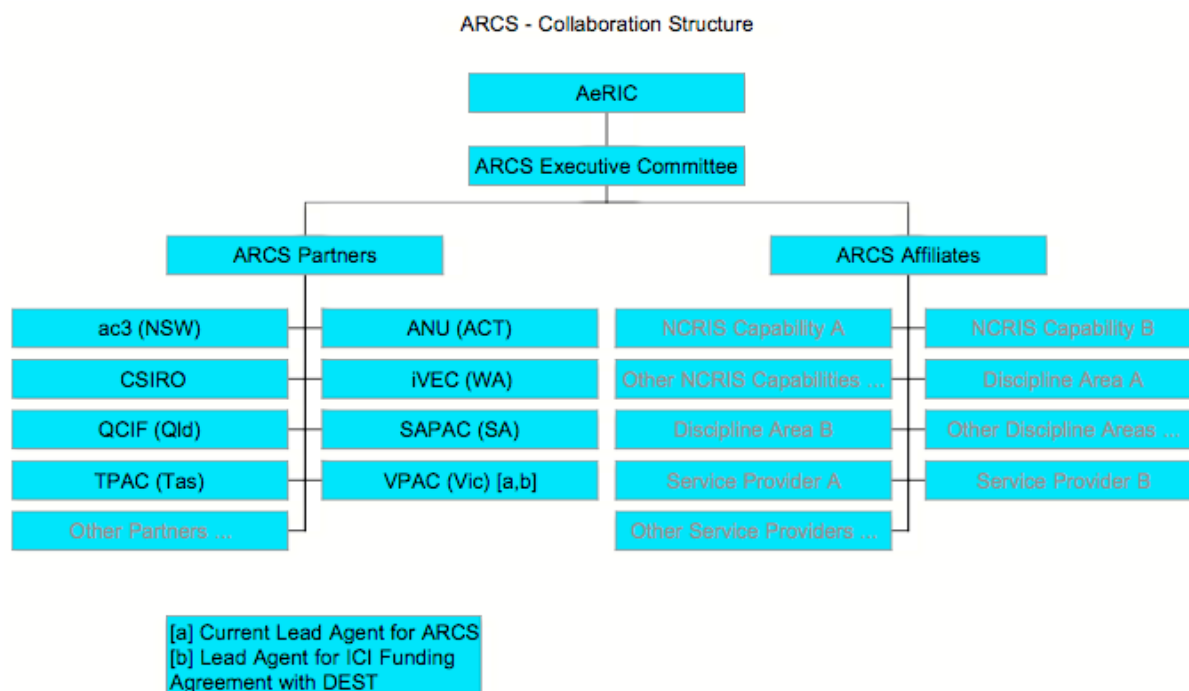
- one member appointed by each of the ARCS partners, e.g., a CEO or Director;
- a nominee of the ARCS Affiliates (non-voting);
- the ARCS Executive Director (non-voting); and
- not more than three independent members appointed by the Executive Committee.

Currently the ARCS EC consists of the following individuals:

- Bernard Pailthorpe, CEO (QCIF), the Interim Chairman
- Robin Stanton, PVC (ANU)
- Phil McCrea, CEO (AC3)
- Gary Doherty, Director - Business Development (CSIRO)
- Andrew Rohl, CEO (iVEC)
- Tony Williams, Director (SAPAC) and Interim Executive Director (ARCS)
- Nathan Bindoff, Director (TPAC)
- Bill Appelbe, CEO (VPAC)

The Commonwealth Funding Agreement also includes a “nominee of the ICI Affiliates” in the EC. This position is currently not filled, but is expected to be filled during the Implementation Period. Observers from Affiliates and other NCRIS areas may attend EC meetings as observers.

The structure of the ARCS collaboration is outlined in the diagram below.



During the Establishment Period, the EC has met weekly to discuss the Collaboration Agreement, hiring of the Executive Director, the Implementation Plan, and other issues in establishing ICI and ARCS. It is expected that during the Implementation Period the EC will meet at least monthly.

ARCS aims to be an open and inclusive organisation. The ARCS Joint Venture Agreement specifies the processes for adding other eResearch service providers as partners or affiliates.

2.2 Management Team

ARCS will have a full-time Executive Director who will manage all aspects of ARCS and the ICI Project. The ARCS Executive Director will be appointed by, and report to, the ARCS Executive Committee.

ARCS will have a full-time Operations Manager, who provides technical advice to the Executive Director and is responsible for managing all operational services and activities. The personnel funded by ICI to support these services will report to the Operations Manager. The Operations Manager will provide technical expertise that is mainly focussed on eResearch middleware and services. David Bannon of VPAC was appointed as Operations Manager at the start of the Establishment Period.

ARCS will have a half-time Projects Manager, who provides technical advice to the Executive Director, and is responsible for managing the User Support and Developmental (NeAT) projects. The personnel funded by ICI to support these activities will report to the Projects Manager. The Projects Manager will provide technical expertise that is mainly focussed on the use of eResearch infrastructure and services to applications, researchers and research disciplines, and will identify commonalities in eResearch requirements across disciplines. Paul Coddington was appointed as Associate Director for the period 1 July 2007 to 31 October 2007 to develop the Implementation Plan. He will act as interim Projects Manager until the position is filled.

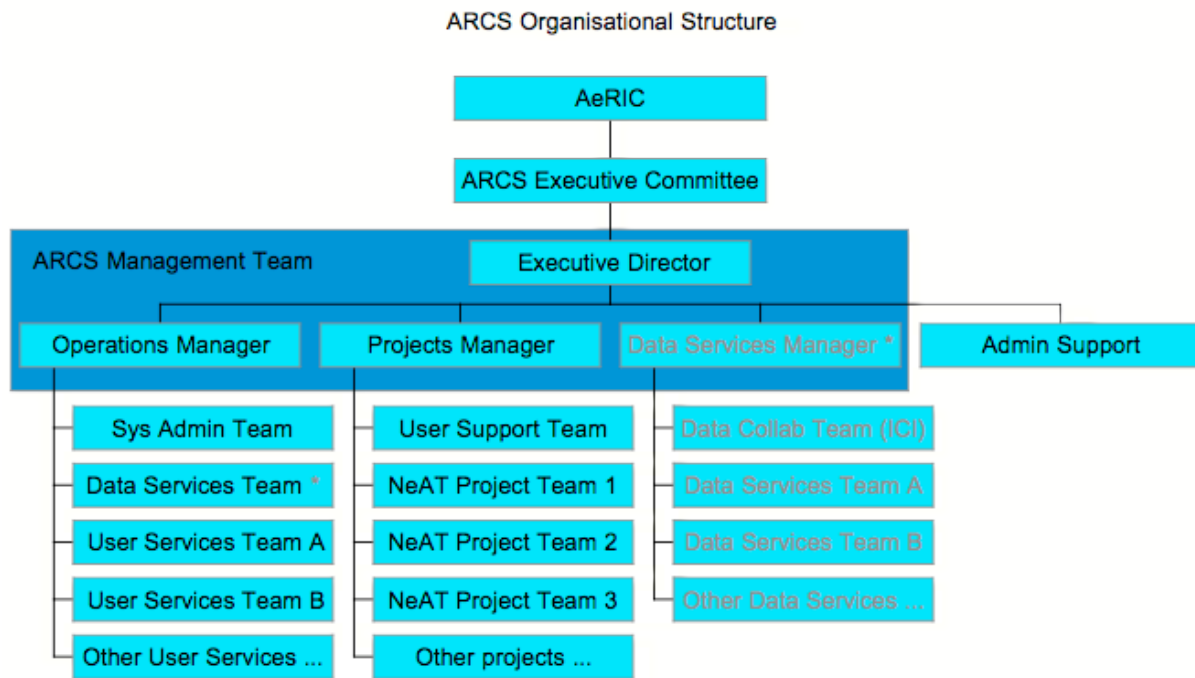
The ARCS Executive Director, Projects Manager and Operations Manager constitute the ARCS Management Team. All staff funded by ARCS report to either the Operations Manager or Projects Manager, who both report to the ARCS Executive Director.

It is possible that additional positions may be added to the Management Team in the future as ARCS evolves. For example, it is likely that a Data Manager position may be created as a higher-level position than the current team leader of the Data Collaboration Services group, and this person would have responsibility for interfacing ICI and ANDS services for example. This appointment is pending the outcome of the process to create ANDS, and in particular, the relationship between ARCS and ANDS.

The management structure is shown in the organizational chart below. The Operations Manager currently manages three teams, each with a team leader. There is currently a single User Services team, but in the future there may be multiple teams based around different types of services. If the Data Manager position is created, the Data Collaboration Services team may move under that position. The Projects Manager oversees NeAT projects, each of which has a team with a project leader, and User Support personnel.

David Bannon was appointed by the Interim ICI EC as Interim Executive Director from 1 July 2007, as well as Operations Manager. Tony Williams, the Director of SAPAC, was appointed as Interim ICI/ARCS Executive Director on 1 August 2007 and will continue half-time in that role until a full-time ARCS Executive Director is appointed. The ARCS Executive Director position has been advertised and applications closed 21 September 2007. An appointment is expected to be made by mid-October 2007.

The new Executive Director may wish to modify some components of the management structure and some other aspects of ICI that are proposed in this Implementation Plan. If this occurs, and the proposed modifications are approved by the ARCS EC, there may be some changes to the Plan and associated changes to the Budget for the Implementation Period. This will be reflected in the revised budget that will be submitted to DEST once the second round of proto-NeAT projects is decided, and an attachment will be provided outlining the changes to the Implementation Plan.



2.3 Administration

VPAC will provide an *ARCS Office* as an organisational unit of ARCS supported by VPAC, including human resources, contract management, report administration, finance and general operational and administrative support services, etc. The ARCS Office costs incurred after signing the EP will be paid from the ICI budget, except that there will be an in-kind contribution by VPAC of financial services (the VPAC accountant) and project management (Karen Iatrou) during the Establishment Period. During the Implementation Period, there is 1.5 EFT for Administrative Staff for the ARCS Office. It is anticipated that at least 0.5 EFT of this 1.5 EFT will be co-located with the Executive Director.

The ARCS Office will also provide secretarial support to the ARCS Executive Committee and keep records of all corporate governance registers and resolutions As specified in the Commonwealth Funding Agreement (*Records and Access to Premises and Records*), the ARCS Office will maintain “full and accurate Records of the conduct of the Project” including detailed financials. A separate account and general ledger has been set up at VPAC for both ARCS and ICI accounting. Financial Management Reports, including Budget Analysis Profit & Loss Statement and Balance Sheet will be provided to the ARCS Executive Committee with records also being made available to the Programme Delegate at DEST upon request.

2.4 Project Management

The project management process will be finalized after the ARCS Executive Director is appointed. The current process is outlined below.

All staff funded by ICI, including the ICI Managers, have written Position Descriptions and workplans listing activities and milestones and/or performance indicators associated with their positions. These are signed off by their ARCS Manager (either the Operations Manager, Projects Manager or Executive Director) who will conduct a documented quarterly review of staff performance at the end of each quarter. Mechanisms will be put in place to ensure that ongoing funding of projects and staff by ICI will be contingent upon meeting milestones and performance indicators documented in the workplans for each staff member. Funding from ICI for project staff will be quarterly in arrears (to ensure accountability), and payment for ICI Office staff and managers will be in advance. All ICI Partners or other Subcontractors (agreed by the Commonwealth) who are employing ICI staff for these activity areas will be issued a Purchase Order for the staff’s service at the start of each quarter. Invoicing for the Purchase Orders will be at the end of each quarter, and payment of the Invoice will be

conditional upon meeting the milestones and performance indicators in the workplans (referenced in the Purchase Orders). The ARCS Executive Director will authorize payment after reading and discussing the reviews with the other ARCS managers.

During the Implementation Period, and after the Executive Director is appointed, additional project management processes will be determined, including:

- Management and review of NeAT projects;
- Requirements, performance indicators and review process for each ARCS service.

Reviewing existing services

In conjunction with the process of considering new services (described in Section 3.2), ARCS will need to conduct regular reviews of its existing operational services, to ensure that they are still relevant to the user community, are being actively used, have an appropriate level of user support, and whether better alternatives might be available. This process may result in a revision of the services provided through ARCS and the effort expended on each service. In some cases there may be a transfer of service provision (and obligations) to other institutions, for example the AAF may eventually take over the provision of the Certificate Authority service from ARCS, or some services may be devolved to university IT departments. This review would be performed by the EC, or a review committee appointed by the EC.

The review process would take place at least once a year, in order to provide input to the Business Plan for the following year. The details of this review process will be determined and documented before the end of 2007.

2.5 Risk Management

Following the Australian Risk Management Standard A/NZS 4360-1999, risks are rated based on their:

- Likelihood – Rare, Unlikely, Possible, Likely, Almost Certain
- Consequence – Insignificant, Minor, Moderate, Major, Catastrophic
- RATING – LOW, MEDIUM, SIGNIFICANT, HIGH

Risk	Likelihood Consequence RATING	Strategy
That not all partners sign the UJV or one or more subsequently withdraws.	Unlikely Moderate MEDIUM	ARCS is working with all Partners in a cooperative manner. ARCS could possibly continue without all partners but would obviously greatly prefer not to.
The key technologies used by ARCS are not appropriate, and services are unreliable.	Unlikely Major SIGNIFICANT	ARCS already has considerable experience in this area and has a strong commitment to training and informing its staff. As ARCS depends on a wide range of technologies, a bad choice of one component would not be considered severe and would be easily recovered from.
Financial impropriety	Rare Major SIGNIFICANT	ARCS and The Lead Agency has procedures in place to make this very unlikely and to minimise exposure in the event of it happening.
ARCS cannot deliver all the necessary services because of a lack of skilled staff.	Possible Major HIGH	ARCS already has many skilled staff involved in its activities, and new staff join an experienced ARCS team as well as a group of experienced staff within each ARCS partner. There has been some staff turnover during the Establishment Period but so far staff have been replaced fairly quickly.

<p>Researchers do not take up the offered services.</p>	<p>Possible Catastrophic HIGH</p>	<p>ARCS has a number of strategies to improve uptake of services: focus on NCRIS capabilities and major research groups that have an acknowledged requirement for ARCS services; strong engagement with end users, particularly in the Data Management Support, User Support and NeAT activities; increased focus on data support and collaboration tools that have potential for very broad use; improving the information and user guides for its services, providing helpdesk support, and developing training material; keeping a close watch on international trends; careful selection of technology to ensure it meets user needs and is easy to use, and development efforts to improve ease of use.</p>
<p>Poor coordination and direction of effort due to dispersion of resources geographically and in supporting many services and users.</p>	<p>Possible Moderate SIGNIFICANT</p>	<p>All staff are part of a project team with regular meetings and team leaders coordinating effort. Operations Manager and Projects Manager keep track of all activities and staff, and Executive Director and EC provide oversight and direction. All projects have milestones and all services will have performance indicators. There are quarterly reviews of staff performance and regular reviews of projects and services.</p>
<p>ARCS does not engage well with other PfC components and related organizations.</p>	<p>Possible Major HIGH</p>	<p>ARCS and other PfC components have a strong commitment to so engaging.</p>

3. Promotion

One of the main activities of the ARCS Executive Director will be to promote ARCS and its services to the research community. Each ARCS partner will also promote ARCS within their organization or region.

ARCS will undertake a number of promotional activities, including:

- Development of an ARCS website, which will be an important activity during the Implementation Period;
- Development of an ARCS logo and web identity;
- An annual report that details the achievements of ARCS;
- Presentations to major research groups, NCRIS capabilities, ARC Research Networks, research institutions, potential affiliates, etc.;
- Development and presentation of eResearch training courses, with sharing of training material between ARCS partners;
- Involvement in the organization of relevant national conferences such as APAC'07 and the Australian eResearch conference;
- Development of international and regional affiliations, with organizations such as Open Grid Forum (OGF), PRAGMA and EGEE. In some cases this involved carrying on and building on affiliations that were developed by APAC;
- Attendance at international events such as OGF, Supercomputing, EGEE meetings, etc.;
- Press releases for major ARCS achievements, and submission of articles to relevant news outlets such as HPCWire, Grid Today, etc.

4. Access and Pricing

Access to all ARCS services and support will be at no charge to all Australian researchers at Universities or Research Institutes such as CSIRO. Access may also be provided to researchers outside Australia provided that such access is in support of international research collaboration that involves Australian researchers.

It is not anticipated that access will be requested or provided for commercial research during the period of this Implementation Plan. Any such commercial access would require the approval of the ARCS Executive Committee and would normally attract appropriate commercial fees.

The ARCS national grid infrastructure (Grid Australia) provides standard, uniform interfaces for accessing and utilising the large-scale compute and storage resources summarized in Appendix B. These hardware resources, and their administration, are not funded by the ICI Program, but are managed by ARCS partners and are funded by a variety of organizations, including universities, state governments, research groups and ARC LIEF grants. Use of these resources is therefore constrained by the policies of the ARCS partner that hosts the resource and the way that the resource has been funded, and would therefore need to be negotiated with the appropriate partner.

However, the regional ARCS partners typically provide free (but quota-limited) access to their computing facilities and storage to researchers from their member institutions, which encompass almost all Australian universities.

4.1 Process for accessing ARCS services

Operational ARCS services will have documentation and user guides available on the ARCS web site, with general user support through the ARCS helpdesk. The User Support staff also provide specialised support services, e.g. for particular discipline areas.

New users can request access to existing ARCS services and support in a variety of ways, including:

- ARCS helpdesk requests;
- contacting an ARCS staff member with national expertise in the researcher's area of interest, e.g. a service or a technology or discipline area;
- contacting their regional or organizational ARCS partner; or
- contacting the ARCS Executive Director, Projects Manager, Operations Manager or Data Manager.

Users will normally be able to make use of the resources of their local ARCS partner, as explained above. NCRIS capabilities and national research collaborations will consist of many researchers from different regions, each of whom will be entitled to access resources managed by their local ARCS partner. ARCS provides Virtual Organization (VO) services that enable members of these collaborations to jointly share access to these collective resources.

In some cases, setting up VOs and determining resource allocations and access rights to multiple ARCS partner resources may be a complex task. ARCS partners have therefore agreed to freely provide access to a limited amount of resources at each partner site to researchers involved in national research collaborations, in order to make it easier for research groups to develop applications that use ARCS infrastructure and services. Once the resource usage becomes significant, research groups will need to negotiate the level of access to the underlying ARCS partner resources, as outlined above. The ARCS Executive Director can facilitate these negotiations.

The process for researchers to request the addition of new services, or significant developmental or user support effort, is described in the next section.

4.2 Process for approving new services or significant user support effort

In consultations with NCRIS capabilities, it has been requested that ARCS develop and advertise processes specifying how research groups can engage with ARCS to request additional services and user support, and how decisions will be made by ARCS as to what services will be supported, and the prioritization of ARCS resources to meet these requests.

The proposed process is outlined below. Upon further discussion, and input from the Executive Director once they are appointed, the EC will finalize the process and document it on the ARCS web site by the end of October 2007.

As described in Section 3.1 above, user groups should be able to engage with ARCS at any level. Some requests may not come directly from user groups, but could for example come from other components of Pfc (NCI or ANDS), or requests for operational deployment of a service developed by a NeAT project.

If the request requires:

1. significant development effort (1 year or more), then this can be discussed with the ARCS Executive Director and needs to go through the NeAT process;
2. significant, dedicated Operational Support or User Support effort, it should be discussed with the ARCS Executive Director, Projects Manager and Operations Manager and a decision on reallocating effort will be made by the Executive Committee;
3. a modest amount of effort (e.g. a few person-weeks or less) that fits into the scope of current ARCS activities and resources, then the Executive Director, Projects Manager and Operations Manager should be notified of the request and they can assign the appropriate resources to handle the request;
4. a small amount of effort that could reasonably be expected to fit into the current duties of ARCS staff, then it can just be handled directly by the contact person, or by the helpdesk process.

In case 2, a written proposal will be required, using a standard pro-forma, to specify:

- the operational services that will be deployed;
- the user groups that the service would support;
- the computational and storage resources required from ARCS partner sites for both the development and operational phases;
- timeframes for the installation and use of the service;
- a plan for how the services would be supported in the longer term, and the level of effort required.

The ARCS EC will decide whether the service will be deployed and what level of effort and resources will be assigned to it. Their decision will need to take into account:

- whether it is an appropriate project that fits within ARCS's mandate of providing national collaborative research infrastructure, services and support;
- the prioritisation of ARCS support to NCRIS capabilities and major national research collaborations that utilize multiple ARCS partner resources, as outlined in the NCRIS Pfc Investment Plan;
- what resources and effort it requires at each ARCS partner site, for how long, and whether partners are willing and able to provide these resources, from ICI-funded effort and/or ARCS partner resources and effort;
- the overall balance of ARCS activities as well as the issues for supporting the service into the future;
- whether the project is technically appropriate and feasible, and achievable within the constraints of the proposed time period and level of effort - this will require technical input, possibly from NeAT;
- Input and direction from AeRIC.

If the request is accepted, a project plan will need to be written, as with any significant ARCS activity.

4.3 Usage

ARCS infrastructure and services are already being used by many research groups and by some NCRIS capabilities. During the Implementation Period, it is expected that usage by the NCRIS capabilities and discipline areas described in 1.2 will significantly increase, and the number of researchers supported by ARCS will broaden with the increased focus on data services and support and collaboration tools.

The web site for the Grid Operations Centre maintains records of all sites that are part of Grid Australia, the users of compute resources, and their applications. During the Implementation Period, this will be broadened to track users and usage of data and collaboration services. Performance indicators will be developed and monitored for all the ARCS services and activities.

5. Financial and Human Resources

The funding distribution proposed for the nine-month Implementation Period, 1 October 2007 to 30 June 2008, is detailed in Appendix A3. The funding distribution describes the individual staff employed using ICI funds, including the nature of their duties, the fraction of time appointed, the dates of the appointment, the location of the staff member and who they report to in ARCS. Three tables are shown with details for expenditure and staff in the areas of (i) ARCS Administration, (ii) Operations and User Support and (iii) Proto-NeAT Projects.

The location of the staff member indicates the local employer who is seconding that person to ARCS for the purposes of delivering the ICI-funded services.

The ICI budget for the nine-month Implementation period is:

- \$535,375 for Administration – Executive Director, Operations Manager, Projects Manager, administrative staff and office costs, ICI travel and international engagement, and contingencies and miscellaneous equipment;
- \$2,087,500 for Operations and User Support projects;
- \$381,249 funded staff (with another \$390,663 in-kind staff provided by ARCS partners and research groups) for proto-NeAT plus proto-NeAT 2 development projects;
- \$3,004,124 – Total Expended ICI funds.

In addition to in-kind staff contributions for the Proto-NeAT Projects, the ARCS Partners will provide office space and IT infrastructure for all projects as an in-kind contribution.

The Administration and Operations and User Support sub-totals add to \$2,648,333, which corresponds to a per quarter expenditure of \$882,778 which is very close to the target per quarter ICI expenditure of \$875,000 on non-NeAT activities.

As explained in Section 1.4, full NeAT development projects will not commence until 1 July 2008. Details of the funding for the first round of proto-NeAT projects, which finish 31 December 2007, are included in Appendix A3. The second round of proto-NeAT projects will run from 1 January to 30 June 2008 and the details of these are also shown in Appendix A3. Also listed is the half-time appointment of Paul Coddington for five months to assist with the development of the full NeAT development projects.

By 31 March 2008 an Annual Business plan will be written and submitted and this plan will:

- provide income and expenditure projections for the period including an itemised budget projection (by source) which indicates:
 - expected ICI income including carry-forward
 - estimated interest income
 - expected co-investment income by organisation
 - expenditure of ICI funds by organisation
 - expenditure of ICI funds by type (eg, staffing, administration, infrastructure related costs)
 - total expenditure by organisation
- describe the expected level and nature of in-kind co-investment and its impact on the Project
- describe the staffing positions funded under the Project.

6. Milestones

The major milestones for the Implementation Period are listed below including the more significant milestones specified in Section 1.2.

In addition, each significant ICI activity (an operational service, a user support activity, or a development project) has a work plan or project plan with specified outcomes and milestones, as outlined in Section 2.4 describing the project management processes. These plans and milestones are available on the ARCS management web site.

Date	Activity	Responsibility
October 2007	Signing of ARCS Joint Venture Agreement	DEST, ARCS Partners
Oct-Dec 2007	Implement ICI governance arrangements	AeRIC, DEST, ARCS EC
October 2007	ARCS Executive Director appointed	ARCS EC
October 2007	ARCS and Grid Australia web sites set up	ARCS Management and Operations
November 2007	Selection of proposed proto-NEAT projects for 2008H1 and specification of funding	AeRIC, ARCS EC, ARCS Management
November 2007	Projects Manager appointed	ARCS EC
December 2007	Information about most ICI services available on ARCS and Grid Australia web sites	ARCS Management
December 2007	Automated testing of ICI services using INCA	ARCS Operations
December 2007	Deployment of standard data storage services	ARCS Operations
December 2007	Toolkit for developing portals for grid job submission	ARCS Operations
December 2007	Acceptance of project plans for proto-NeAT projects	AeRIC, ARCS EC, ARCS Management
January 2008	Review of ARCS services and projects	ARCS Management
January 2008	Decision on supported videoconferencing tools	ARCS Management, AeRIC
January 2008	Decision on supported collaboration tools	ARCS Management, AeRIC
January 2008	Plan for gLite deployment and trial deployment at one ARCS partner site	ARCS Operations, gLite proto-NeAT project
March 2008	Performance indicators and usage information available for most services	ARCS Operations
March 2008	Collaboration tools provided for some research groups	ARCS Operations
March 2008	Selection of NeAT projects starting 1/7/2008 and specification of funding	AeRIC, ARCS EC, ARCS Management
March 2008	Business Plan for year 2 submitted	ARCS Executive Director
June 2008	Provide solutions for metascheduling	ARCS Operations
June 2008	More extensive information about all ICI services and activities available on ARCS and Grid Australia web sites	ARCS Management
June 2008	Increased usage of ICI services based on defined usage metrics and number of users	All ARCS staff
June 2008	Acceptance of project plans for NeAT projects	AeRIC, ARCS EC, ARCS Management

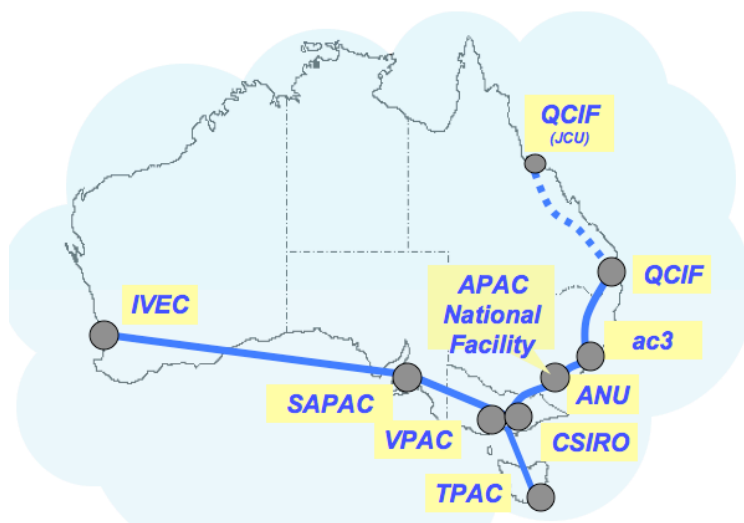
As noted above, payment for work done on ICI projects and services will be in arrears, on completion of milestones and service delivery targets. It is anticipated that such payments would be made quarterly, from funds held in escrow by VPAC under the terms of the Commonwealth Funding Agreement.

All milestones and payments for work done on ARCS projects and services require the approval of the ARCS Executive Director, with appropriate and auditable records to be kept of achieving such milestones, approval, and payments. Payment would only be made under the additional conditions specified in the Purchase Orders, that all work performed was in compliance with the Commonwealth Funding Agreement. These conditions are specified in the Collaboration Agreement. During the Establishment Period, all ARCS Partners provided a signed letter on file indicating the Member's intention to sign the Collaboration Agreement and comply with the Commonwealth Funding Agreement.

Appendix A – Projects, Services, and Personnel

A1 Operational Services and Support

The core operational ICI services provide a set of standard, uniform interfaces for accessing heterogeneous computational and storage resources that are distributed across ARCS partner sites, as shown below. These services and resources make up the national grid computing infrastructure, known as Grid Australia.



Additional services include the provision of general collaboration tools, as well as application-specific portals to make it easier for researchers to use the infrastructure, and tools to make it easier for developers to create portals and other applications.

The services offered are under constant development at present; a situation expected to be the case for some time. Provision of these services is based, as much as is possible, on technologies and existing systems being developed by the global research and commercial IT communities.

The resources required to provide these services are listed in A3.

Systems Level Services

Operated By – Operations Support Team

Used By – Most other Services

Depends on – Partners Existing and future compute and storage systems

Technology – Linux, Xen, Gateway Hardware

Strategy – These services are substantially in place, the technology is relatively mature and while it will be subject to constant updates and revision, the changes will be minor and gradual. Based around the concept of 'Gateways' at present, these services provide a scalable and flexible interface to a diverse range of hardware. While currently focused on HPC Compute its being scaled out to storage collaborative services and will be applied to a much wider range of systems in the future.

Authentication Services

Operated By – AA Staff from within the Operations Support Team, nominated people at a number of sites who have been appointed to the role of 'RAO' and who are required to sight documentary evidence

of an application's authenticity.

Used By – All End Users, developers and most associated hardware, ANDS

Depends On – AAF, IGTF (International Grid Trust Federation), OGF

Technology – GSI, OpenCA, SSL, X509, Shibboleth, MAMS

Strategy – Currently a Certificate Authority is operated by the Operations Support Team, this CA is recognised by the IGTF and therefore Compute Grids around the world. It is expected that much of the authentication will be taken over by the AAF as AAF credentials appear in researchers hands. While adoption rate of the AAF approach by individual Universities is difficult to forecast, it is fair to say that it will happen and will be a much better experience for end users when it does. There are still a considerable number of technical problems to solve, however, they are not considered to be a significant barrier.

Authorisation Services

Operated By – Operations Support Team, Systems Staff at Partner Sites, Systems Staff at Universities, AAF

Used By – All End Users, developers, ANDS.

Depends on – AAF, existing authorisation infrastructure.

Technology – GSI, VOMS (GUMS, PRIMA, VDT etc), Shibboleth, MAMS (?)

Strategy – The Grid technology already in use has a range of Authorisation (AuthZ) services and capabilities that are difficult to map to the models in use in the underlying systems. On the other hand, much work is happening around the world in the area and there is every reason to believe that tools will become more flexible and easier to use. Much of the difficulty is related to policies rather than technology and the project must take into account the wide diversity of rules and constraints applying at partner and service provider sites. It is reasonable to expect that as eResearch becomes the default way of doing more things these policies will become more transparent and easier to work with.

Data Movement and Access Services

Operated By – Data Collaboration Services Team

Used By – Data Staging Services, ANDS, end users

Depends on – Systems Level Services, partner storage infrastructure, network infrastructure

Technology – VDT, gLite, Globus, gridFTP, LDR, OpeNDAP, SRM and others

Strategy – these services will provide an underlying infrastructure to move data between grid sites, data sources (e.g. instruments) and other data storage locations. The service will provide various tools to move data on an ad-hoc basis, as well as automatic tools to collect data from instrument sites and to replicate data to required locations. The service would be managed to make best use of the underlying network and storage resources. Tools will also be provided to allow end users or other services to access data at the storage locations as required. Some activities of this service will be complementary to ANDS.

Data Staging Services

Operated By – Operations Support Team

Used By – Job Launch Services

Depends on – Data Movement Services

Technology – VDT, gLite, Globus

Strategy – Data Staging is movement of data as an ancillary part of a compute job, typically before or after the job and has a life determined by the life of the compute job itself. These services are part of the tools that make up the Job Launch Services, but have been configured to make use of the optimised infrastructure provided by the Data Movement Services.

Job Submission Services

Operated By - Operations Support Team

Used By – User Support Developers and End users.

Depends On – Systems Level Services, Data Staging Services, Information Services

Technology – VDT, gLite, Globus

Strategy – These services are operational now but are subject to frequent change and need to be constantly reviewed. While existing services are based on VDT the structure of the Systems Level Services makes it possible to support any number of parallel systems (limited by resource availability). It would seem likely that active support for gLite will happen some time after release of gLite 3.1. Expect to see technology such as BES to become increasing influential.

Accounting Services

Operated By – Operations Support Teams

Used By – Operations Support Team, Developers, End Users, Partner Sites.

Depends on – Grid Operations Center, VDT, gLite

Technology – various.

Strategy – As much of the actual hardware resources are 'owned' by third parties, a reliable and easy accounting system is required. At present this is provided by the GOC and partners can use a web service to determine usage information of their site. gLite (if adopted) has accounting “built in” that may form the basis of future models, or may need work to translate to existing models. Accounting for Data and Collaborative services is under investigation.

Monitoring Services

Operated By – Operations Support Team

Used By – Operations Support Team, Developers, End Users, Partner Sites.

Depends on – Grid Operations Center, VDT, gLite

Technology – INCA, gLite.

Strategy – A prime characteristic of a complicated system like the infrastructure under discussion is that it is often unreliable and difficult to diagnose. Systems are in place to monitor gateway machines and to alert appropriate people if necessary. A number of tools are under development around the world and locally to constantly test end to end systems and some, such as GITS are already operation within the National Grid however it does not support GT4 services. gLite (if adopted) has a range of monitoring systems “built in” that may form the basis of future models, or may need work to translate to existing models. INCA is becoming a standard mechanism for monitoring grid services and we plan to move to using this for monitoring grid and data services.

Information Services

Operated By – Operations Support Team

Used By – End users, applications, metaschedulers.

Depends on – Systems Level Services

Technology – MDS, GLUE, VDT, BDII, gLite

Strategy - As the infrastructure becomes more automated, users, metaschedulers and applications become more capable of making intelligent decisions about what resources to use. Information Services provide essential information for those decisions. While the underlying technology is immature, there is a range of information now available and more useful information will be available in the near future as international developments start to deliver.

Demonstration and Training Activities

Operated By – Operations Support Team, User Support Team

Used By – Developers and to a lesser extent, end users.

Depends on – All above Services.

Technology – Example application Code (e.g. in Java) and similar.

Strategy – Its necessary to provide demonstrations of the above services in use, as example code, as training courses, as libraries and as direct support or help.

Portal and Application Creation Services

Operated By - Operations Support Team, User Support Team, NEAT Team

Used By – Developers, End Users.

Depends On - AAF, Authentication Services, Authorisation Services.

Technology – gridsphere, tomcat, Java, web services

Strategy – These Services cover a wide range and are only starting to be well defined in the current model. Some services will initially be brought into existence by user facing teams and will, as they mature, move toward being core services. Clear definitions will be required between applications being built for end users, applications being built as templates and infrastructure being built to cater to those applications.

Collaboration Services

Operated By - Operations Support Team, User Support Team, NEAT Team

Used By – End Users.

Depends On – AAF, MAMS, Authentication Services, Authorisation Services.

Technology – Access Grid, EVO, Sakai, wikis, other shared Workspace tools, Trac

Strategy – These services are possibly less well know to the existing teams, indeed, much of the content is still only being developed or is subject to research projects at present. However, it is important that an active start be made in this area because of its potential to give researchers a significant early advantage and to ensure the Teams are sufficiently skilled and knowledgeable in the area to recognize valuable developments as they appear. Significant work in this area has already been done by the MAMS group, and there is significant expertise in Access Grid.

A2 Development projects

A number of possible NeAT development projects have been suggested in the discussions with ARCS partners, NCRIS capabilities and other researchers. Some of these might be considered for proto-NeAT projects in the first half of 2008.

The proposed projects typically fall into two categories: enhancement or addition of generic ICI tools and services; and addressing the requirements of particular NCRIS capabilities or research disciplines.

Generic tools and services

Collaboration Tools: There are many software packages that provide web-based collaboration tools. ARCS would like to offer research collaborations a standard, preferably open source, suite of integrated collaboration tools that has a strong development team and broad user base, is easy to host and maintain, easily configurable for a particular research collaboration, is easy to use, robust, and can make use of AAF.

Videoconferencing and Access Grid: Videoconference is an important collaboration tool that is becoming more widely used, and is likely to see even more uptake with the rollout of high-speed dedicated research networks. However, currently videoconferencing tools such as Access Grid and EVO can be hard to install, hard to use, and unreliable. This project would aim to provide more reliable tools, which would require working with the users, software developers and infrastructure providers in order to improve the user experience.

gLite middleware: ICI grid services are based on Globus and VDT. Some major international grid initiatives, notably EGEE and LCG, use the gLite middleware, which offers some advantages, particularly for large-scale data management and transfer, and simple metascheduling of jobs. This middleware is required for experimental and theoretical high-energy physics (HEP) research groups in Australia, who are involved in international research projects that require the use of gLite and its data management system based on SRM. This project would work with the HEP community to deploy a gLite grid infrastructure at multiple sites, initially to support HEP, but the project would also explore the possibility of deploying a variety of applications based on gLite that have been created by the EGEE project.

Workflow engines and tools: workflow technologies (e.g. Kepler, Taverna, Pegasus) are expected to enhance researchers' productivity, since these can automate data handling and processing tasks. These tools can also be used to create high level, user oriented software services from smaller, lower-level components. Although workflows can be hard to implement and are user/domain-specific, they have great utility when properly implemented. Workflows and portals can be the entry to advanced ICT infrastructure and services for many users, organisations and NCRIS capability areas. A workflow project could develop some example workflows for particular applications, with the aim of providing exemplars that could be modified and re-used.

Use of AAF services, Shibboleth and GridShib: the use of ARCS services, particularly via portals, would be made much easier for end users if they could login using the usual authentication process at their institution rather than having to deal with grid certificates and proxies.

Nimrod: a current proto-NEAT project provides some effort to develop and maintain a national Nimrod portal and for further Nimrod development to enhance the functionality based on user requirements.

Condor: some institutions have deployed Condor pools to utilize spare cycles on desktop machines such as computers in student labs. Condor is also widely used for grid job submission. However there is limited expertise and use of Condor within ARCS and it is not currently supported. Developing a plan for how to integrate institutional Condor pools into ICI, and support the use of Condor/G and/or Condor/C for jobs submission would be a worthwhile project, particularly if it were done with some user groups that could use this capability, e.g. Australian collaborators in the LIGO project, or users who already use institutional Condor pools. However this work could perhaps be done by some of the Operations Support team.

Support of NCRIS capabilities and research disciplines

All of the NCRIS capabilities that have been identified as priority areas for PFC have challenging problems in data management, data analysis and modelling that can only be effectively addressed by the use of eResearch infrastructure and services. It is recommended that development projects be undertaken with all of the following

NCRIS capabilities and application areas. This will provide much-needed eResearch support for researchers in these areas, but will also ensure that these areas will make use of appropriate technologies, resources and services that are being supported by ARCS, help identify additional services and capabilities that ARCS needs to be provide, allow ARCS to identify commonalities that will avoid duplication of effort, and broaden the user base of ARCS services. Also, all of these areas also require capabilities that would be provided by ANDS, so these projects would ensure close interaction between ANDS and ARCS.

5.1 Biomolecular Platforms

The bioinformatics component of NCRIS 5.1 is working on identifying standard computational and data management services that are required by the researchers working on genomics, proteomics and phenomics. Portals and automated workflows are likely to be of significant benefit here. ARCS can assist in the development of the tools and services that will be developed by the bioinformatics component of 5.1. A number of bioinformatics development projects are currently being supported as proto-NEAT projects and it is expected that these would be integrated with the 5.1 bioinformatics effort in the second round of proto-NEAT projects.

5.3 Characterization

Some work has already been done in this area through various ARC eResearch Support projects and ARCHER, including the development of GRANI for the electron microscopy community and the work with CIMA, SRB repositories, and remote control mechanisms for X-ray diffraction instruments. There are also many international efforts in this area. Requirements differ for the different components of this capability (electron microscopy and imaging, neutron diffraction, X-ray diffraction) so different projects may be required. There has already been a significant amount of work done to document requirements for this capability, with suggestions for how it might be supported by PfC. An underlying requirement for all components of 5.3 is assistance in moving to storing the data in federated repositories that could be supported on an operational basis by the ARCS data management team, with tools for metadata generation, annotation, and search.

5.10 Astronomy

Some major new optical and radio telescopes are being deployed as part of NCRIS 5.10. They will generate enormous amounts of data (of order a petabyte per year within the next few years) that will need to be processed in real-time, transferred from remote locations, stored, analysed, and made available in repositories conforming to the standards of the International Virtual Observatory Alliance. Some work is already being done for supporting optical telescopes under an ICI User Support project, but a larger development project is needed to work on this as well as to assist the pathfinder projects for the Square Kilometre Array. These projects will require engagement with the ARCS data management team as well as ANDS.

5.11 Australian Environmental Observation Network (AEON) and

5.12 Integrated Marine Observing System (IMOS)

Many of the requirements of IMOS would be very similar for AEON, and there is likely to be significant commonalities in the eResearch services and tools for both of these NCRIS capabilities, as well as Earth Systems Science. The main challenge is the integration of many disparate data sets, from large-scale satellite data sets to simple information from sensors, and to providing a mechanism for indexing and searching the data, including support for spatial queries. This is likely to be a job for ANDS.

The services that ARCS can assist in developing might include web services for data processing and analysis, and the management and efficient movement of large-scale distributed data sets. Much of the data will be generated by instruments and sensors in the field, which would benefit from standard interfaces for monitoring, control and data download.

5.13 Structure and Evolution of the Australian Continent

AusScope is fairly advanced in developing a sophisticated service-oriented architecture and tools for supporting complex workflows. A project in this area would have the advantage of working with a large development team who are early adopters of eResearch with significant expertise and experience, and need to use many of the ICI services to develop their applications.

Other discipline areas that could benefit from development projects include Earth System Science, climate modelling, and computational chemistry, all of which have existing User Support or proto-NEAT projects to develop tools such as portals for job submission or data management.

A3 Funding Distribution

The proposed distribution of ICI funding for the nine month Implementation Period (1 October 2007 to 30 June 2008) is as follows.

Administration

Role (cost p.a. per EFT)	Person	Location	Effort (period if not IP, cost)	Reporting to in ARCS
Executive Director	Tony Williams	SAPAC	100% (from 6/12/07, \$135k)	Executive Committee
Interim Executive Director (\$180k)	Tony Williams	SAPAC	50% (until 5/12/07, \$16k)	Executive Committee
Associate Director (\$180k)	Paul Coddington	SAPAC	100% (until 31/10/07, \$15k)	Executive Committee
Projects Manager (\$180k)	Paul Coddington	SAPAC	Funded through NeAT from 1/11/07 until 31/3/08, 50% (from 1/4/08, \$15k)	Executive Director
Operations Manager (\$180k)	David Bannon	VPAC	100% (\$135k)	Executive Director
Administration (\$75k)	Natalie Bisticic & Sharon Johnson	VPAC & SAPAC	150%=100% & 50% (\$56.25k & \$28.125k)	Executive Director
Travel & International Engagement (\$150k)	Operating costs	ARCS	100% (\$112.5k)	Executive Director
Contingencies & Miscellaneous Equipment (\$30k)	Operating costs	ARCS	100% (\$22.5k)	Executive Director
		Total	\$535.375k	

Operations and User Support

ICI funded personnel currently nominated as part of ARCS Operations Group or for User Support. Some of the main users groups supported by particular Data Collaboration Services and User Support personnel are specified, but they will typically support other groups also. Similarly, some of the services that are the responsibility of particular User Services personnel are specified, but they will be flexible enough to work on other services and provide general user support as required.

Role (cost p.a. per EFT)	Person	Location	Effort (period if not IP, cost)	Reporting to in ARCS
Sys Admin – Team Leader (\$100k)	Daniel Cox	SAPAC	100% (\$75k)	Operations Manager
Sys Admin (\$100k)	Youzhen Cheng	ac3	100% (\$75k)	Operations Manager
Sys Admin (\$100k)	Jason Ozolins	ANU-NF	50% (\$37.5k)	Operations Manager
Sys Admin (\$100k)	TBA	CSIRO HPCCC	100% (\$75k)	Operations Manager
Sys Admin (\$100k)	Darran Carey	iVEC	100% (\$75k)	Operations Manager
Sys Admin (\$100k)	Will Hsu	QCIF	100% (\$75k)	Operations Manager
Sys Admin (\$125k)	Russell Sim	QCIF (JCU)	50% (\$46.875k)	Operations Manager
Sys Admin (\$100k)	Leigh Gordon	TPAC	50% (\$37.5k)	Operations Manager
Sys Admin (\$100k)	Andy Botting	VPAC	100% (\$75k)	Operations Manager
User Services – Team Leader, Portals (\$125k)	Ashley Wright	QCIF (QUT)	100% (\$93.75k)	Operations Manager
User Services – Certificate Authority, VO and AAA (\$125k)	Chris Kendrick, replaced by Sam Morrison	VPAC	100% (\$93.75k)	Operations Manager
User Services – AAA, Portals, Collaboration Tools (\$125k)	Markus Binsteiner	VPAC	100% (\$93.75k)	Operations Manager
User Services - Information Services, Portals, Client Tools (\$125k)	Sean Fleming	iVEC	50% (\$46.875k)	Operations Manager
User Services - Information Services, Monitoring Services, Metaschedulers (\$125k)	Gerson Galang	SAPAC	100% (\$93.75k)	Operations Manager
User Services – Videoconferencing (\$125k)	Jason Bell	QCIF (CQU)	50% (from 1/1/08, \$31.25k)	Operations Manager
User Services - AAF	Russell Sim	QCIF (JCU)	50% (\$46.875k)	Operations Manager

Integrated Tools, Collaboration Tools (\$125k)				
Data Collaboration Services – Team Leader, NCRIS 5.3, 5.10, LIGO (\$125k)	Stephen McMahon	ANU-NF	100% (\$93.75k)	Operations Manager
Data Collaboration Services – NCRIS 5.10, 5.13 (\$125k)	Florian Goessmann	iVEC	100% (\$93.75k)	Operations Manager
Data Collaboration Services - NCRIS 5.3, 5.10, LIGO (\$125k)	Joseph Antony	ANU-NF	50% (\$46.875k)	Operations Manager
Data Collaboration Services – NCRIS 5.13 (\$125k)	David Gwynne, replaced by Kai Lu	QCIF (UQ)	100% (\$93.75k)	Operations Manager
Data Collaboration Services – NCRIS 5.2, 5.3, HEP (\$125k)	Shunde Zhang	SAPAC	100% (\$93.75k)	Operations Manager
Data Collaboration Services – ESS, NCRIS 5.12 (\$125k)	Pauline Mac	TPAC	100% (\$93.75k)	Operations Manager
Data Collaboration Services – ANSTO, NCRIS 5.3, 5.10, climate modelling (\$125k)	Martin Thompson, replaced by Jonathon Elliott	ac3 (UNSW)	100% (until 31/12/07 & 50% from 1/1/08, \$62.5k)	Operations Manager
Data Collaboration Services (\$125k)	Mark Favas	CSIRO	100% (\$93.75k)	Operations Manager
User Support (\$125k)	Gareth Williams	CSIRO HPCCC	100% (\$93.75k)	Projects Manager
User Support – NCRIS 5.1 (\$125k)	Tony Maher, replaced by Simon Diong	ac3 (UTS)	100% (93.75k)	Projects Manager
User Support, NCRIS 5.10 (\$125k)	Jon Smillie	ANU-NF	(100% until 31/12/07 & 50% from 1/1/08, \$62.5k)	Projects Manager
User Support, NCRIS 5.13 (\$125k)	Sean Fleming	iVEC	50% (\$46.875k)	Projects Manager
User Support, NCRIS 5.12 and ESS (\$125k)	Leigh Gordon	TPAC	50% (\$46.875k)	Projects Manager
		Total	\$2087.5k	

Proto-NeAT

Staff for proto-NeAT projects funded until 31/12/07.

Note 1. Proto NEAT projects are for nominally six months. The first round of proto-NeAT projects was funded for Q3 and Q4 2007, the cost for the projects in the table below refers to the cost during the Implementation Period, i.e. Q4 2007.

Note 2 'effort' refers to the percentage of a person's time. So a total 50% + 50% effort over 6 months would be one half of an annual EFT worth of work and that person would be working full time on the project over 6 months. Similarly, someone working 100%+0 or 0+100% would be working full time on the project.

Proto NEAT Role (cost p.a. per EFT)	Person	Associated Site	Effort Funded + Effort In-kind (period if not 2007Q4, cost)
Bioinformatics (\$125k)	Tony Maher Mike Lake	ac3 (UTS) UTS	50% + 0% 0% + 50% (\$15.625k + \$15.625k)
Training Material (\$125k)	Joachim Mai Achim Casties	ac3 ac3	12.5% + 12.5% 12.5% + 12.5% (\$7.812k + \$7.812k)
Chemistry (\$125k)	Vlad Vassiliev	ANUSF	50% + 50% (\$15.625k + \$15.625k)
NCRIS 5.1 (\$125k)	Hiew Hong Liang	iVEC	50% + 50% (\$15.625k + \$15.625k)
Access Grid (\$125k)	Chris Willing D Kosovic Eric Liao Jason Bell	QCIF QCIF QCIF QCIF	100% + 0 0 + 50% 0 + 50% 0 + 100% (\$31.25k + \$62.5k)
Bioinformatics (\$125k)	Sam Moskwa Julian Schwerdt	SAPAC SAPAC	100% + 0 0 + 100% (\$31.25k + \$31.25k)
Bioinformatics (\$125k)	Mhairi Marshall	QCIF	50% + 50% (\$15.625k + \$156.25k)
Nimrod (\$125k)	Colin Enticott	VPAC - Monash	50% + 50% (\$15.625k + \$15.625k)
AeRIC/NeAT project planning (\$180k)	Paul Coddington	SAPAC	50% + 0% (1/11/07 to 31/12/07, 15k + \$0k)
GLite and High-Energy Physics (\$125k)	Marco la Rosa	VPAC - Melbourne	50% + 50% (\$15.625k + \$15.625k)
		Total	\$179.062k funded + \$195.313k in-kind

Proto-NeAT 2

Staff for proto-NeAT 2 projects funded from 1/1/08 until 30/06/08.

Proto NEAT Role (cost p.a. per EFT)	Person	Associated Site	Effort Funded + Effort In-kind (period if not first half of 2008, cost)
Neutron and X-Ray Data Grid (\$125k)	Martin Thompson Romain Quicili Doug du Boulay	ac3 Sydney Sydney	100% + 0% 0% + 50% 0% + 50% (\$62.5k + \$62.5k)
Chemistry (\$125k)	Vlad Vassiliev Ivan Rostov Babu Kannappan Joachim Mai	ANU ANU ANU ac3	50% + 30% 0% + 10% 0% + 10% (\$31.25k + \$31.25k) 25% + 25% (\$15.625k + \$15.625k)
NCRIS 5.1 (\$125k) (to be confirmed)	Hiew Hong Liang	iVEC	50% + 50% (\$31.25k + \$31.25k)
Access Grid (\$125k)	Chris Willing D Kosovic	QCIF QCIF	50% + 25% 0 + 25% (\$31.25k + \$31.25k)
Bioinformatics (\$125k)	Sam Moskwa Joy Raison David Adelson Heath James Julian Schwerdt	SAPAC SAPAC Adelaide SAPAC SAPAC	100% + 0% 0 + 50% 0 + 15% 0 + 20% 0 + 15% (\$62.5k + \$62.5k)
Bioinformatics (\$125k)	Mhairi Marshall David Wood Matthew Bryant	QCIF – QFAB QFAB QFAB	50% + 0% 0% + 25% 0% + 25% (\$31.25k + \$31.25k)
Nimrod (\$125k)	Colin Enticott Slavisa Garic Blair Bethwaite	VPAC – Monash VPAC – Monash VPAC - Monash	25% + 25% 25% + 25% 0% + 25% (\$31.25k + \$46.875k)
Astronomy (\$125k)	Jon Smillie Tim Preston	ANU ANU	50% + 0% 0% + 25%

	astronomers	various	0% + 25% (\$31.25k + \$31.25k)
AeRIC/NeAT project planning (\$180k)	Paul Coddington	SAPAC	50% + 0% (1/1/08 to 31/3/08, \$22.5k + \$0k)
		Total	\$202.187k funded + \$195.350k in-kind

Appendix B – Initial resources accessible via ICI

The following tables provide a list of the physical resources held by ICI members, AC3 (NSW), ANU (ACT), iVEC (WA), QCIF (Qld), SAPAC (South Australia), TPAC (Tasmania) and VPAC (Victoria).

The inter-operation infrastructure will make all of these resources available within a seamless access environment. In addition, ICI will extend that access to resources in its affiliates.

No explicit provision for networks, buildings for housing this equipment, or operational costs such as power and air conditioning have been included. Some of the sites are compliant with ISO standards for machine room construction and security. Staff resources to manage these facilities is significant and that cost is met by the ARCS partners.

Data Resources

The estimated replacement cost of these resources is \$5M.

	Disk TB	Tape TB	Tape Resource	Owner	Acquisition
ac3	6	12	Dell PV136T	UTS	Current
ac3	10	24	SpectraLogic	UTS	Oct 2007
ANU	60	512	STK 9310 tape silo	ANU/APAC-NF	Current
ANU		100	STK 9740 tape silo	ANU/APAC-NF	Current
iVEC	90	512	Sun SL8500 Tape Library	CSIRO	Dec 2007
iVEC	30			University of Western Australia	current
QCIF	15	220	STK PowderHorn	University of Queensland	Current
QCIF	60			Griffith University	Current
QCIF		95	STK L180 tape silo	James Cook University	Current
QCIF	30		STK SL500 tape silo	Queensland Univ. of Technology	June 2007
QCIF	8	50			Dec 2007
SAPAC	40	40	STK	University of Adelaide	current
SAPAC		268	Upgrade to STK	University of Adelaide	Nov 2007
TPAC	50	66	STK	University of Tasmania	Current
VPAC	12			VPAC	current
TOTAL	410	1,895			

Compute Resources

The estimated replacement cost of these resources is \$20M.

Partner	Processors	Resources	Owner
ac3	634	Dell cluster (378), SGI Altix 4700 (256)	UTS
ANU	828	Share on APAC NF (700), cluster (128)	ANU
iVEC	168	SGI Altix 3700 (168)	CSIRO
iVEC	164	Cray XT3 (164)	UWA
iVEC	160	Cluster (160)	Murdoch University

QCIF	824	SGI Altix 3700 (132), ACcESS MNRF SGI Altix 3700 (208), Chemistry cluster (256), Physics cluster (128), IMB cluster (100)	University of Queensland
QCIF	208	SGI Altix SE cluster (112), SGI Altix 4700 (96)	Queensland Univ. of Technology
QCIF	192	Sun opteron cluster (128), Sun Ultraspac cluster (64)	Griffith University
QCIF	240	Sun opteron cluster (156), SGI Altix 3700 (94)	James Cook University
SAPAC	960	SGI Altix XE1300 (544), SGI Altix 3000 (160), IBM eServer 1350 (256)	University of Adelaide
TPAC	148	SGI Altix 4700 (128), Physics SGI Origin 3400 (20)	University of Tasmania
VPAC	778	IBM Power5 cluster (184), x86 Cluster (194), Opteron clusters (400),	VPAC
	5,314	TOTAL	

Visualisation Resources

The estimated replacement cost of these resources is \$4M.

	Resources	Owner
ANU	3D visualisation, 3D wedge, Virtual environment, Access Grid x3	ANU
iVEC	3D wedge	CSIRO
iVEC	100 seat stereo-enabled auditorium, Stereo lab	CSIRO
iVEC	Access grid x5	iVEC
iVEC	Immersive dome, Stereo lab	The University of Western Australia
QCIF	ViSAC visionarium, Access grid x5	University of Queensland
QCIF	Access grid x5	Queensland University of Technology
QCIF	3D Wedge, Access grid x2	Griffith University
QCIF	Access grid x4	James Cook University
SAPAC	3D visualisation auditorium	South Australian Virtual Reality Centre
SAPAC	3D visualisation, Access grid x3	SAPAC
TPAC	Access grid x1	University of Tasmania